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Technical Notice

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To: CCS' relevant departments of the headquarters, plan approval centers, surveyors/auditors, relevant ship building/repairing yards, designers, ship owners, ship management companies and equipment manufacturers

Technical Notice on Implementation Plan for Marine Air Pollutant Emission Control Areas

The Ministry of Transport of China released the *Implementation Plan for Marine Air Pollutant Emission Control Areas* on 10/12/2018 (hereinafter referred to as the Plan, as included in Attachment 1). In the Plan, the geographical areas, pollutants controlled, emission control limits, implementation time and requirements are adjusted.

The Plan will be implemented on 1 January 2019. In order to facilitate interested parties becoming familiar with the requirements of the Plan and making preparation, so as to ensure effective implementation of the Plan, this Notice briefly introduces the main change of emission control requirements, key technical points for the new standards, the measures for uniform implementation of IMO global 0.50% fuel oil standard, and the experiences on implementation of 0.10% fuel oil standards for ECA, for reference by interested parties.

The Technical Notice mainly covers the following contents:

1 Interpretation of Implementation Plan on Marine Air Pollutant Emission Control Areas

2 Types, safety impacts and control measures of compliant fuel oils

3 Marine SOx emission control solutions and rule systems

4 Latest technical information of implementing 0.50% low sulphur fuel oil standard

5 list of relevant documents (attachments or download links)

6 Reference documents published by relevant international organizations and download links

7 Subsequent suggestions and technical services provided by CCS

1 Interpretation of Implementation Plan on Marine Air Pollutant Emission Control Areas

1.1 Changes to the requirements for emission control

Compared with the 2015 Implementation Plan on Marine Emission Control Areas, the main changes of this Plan are summarized as follows:

(1) Geographical Scope extension of emission control areas

Coastal control areas: the general scope includes all sea areas and ports within 12 nautical miles of the baseline extension of Chinese territorial sea (excluding waters under the jurisdiction of Hong Kong, Macao and Taiwan), as well as Hainan waters and ports specially designated.

Note: refer to the coordinates of boundary control points listed in Table 1 and Table 2 of the Plan for specific control areas.

Figure 1 Coastal Control Areas Stipulated in the Plan (schematic diagram)

Inland control areas: navigable waters of the Yangtze river main lines (from Shuifu in Yunnan Province to Liuhe Estuary in Jiangsu Province) and the Xijiang River main lines (from Nanning in Guangxi Province to Zhaoqing in Guangdong Province).

Note: refer to the coordinates of starting and ending points listed in Table 3 of the Plan for specific control areas.

Figure 2 Inland Control Areas Stipulated in the Plan (schematic diagram)

(2) Sulphur content limits of fuel oils

The sulphur content of fuel oil is more strictly controlled, for example, requiring that the sulphur content of marine fuel oil used by seagoing ships entering the emission control areas should not exceed 0.50% from 1 January 2019; the sulphur content of marine fuel oil used by seagoing ships entering the inland emission control areas should not exceed 0.10% from 1 January 2020; the sulphur content of marine fuel oil used by seagoing ships entering Hainan Waters of coastal control areas should not exceed 0.10% from 1 January 2022; inland and river-sea ships entering inland emission control areas are to use marine fuel oils or diesel oils in accordance with relevant standards and requirements from 1 January 2019, etc.

(3) Emission pollutants

Please refer to part 1.2 of this Notice for summary requirements on SOx emission control of the Plan.

In addition to SOx emission pollutants, the control requirements for nitrogen oxide (NOx), oil and gas recovery (mainly manifesting in volatile organic compounds (VOC) emissions) have also been put forward, of which the special emission control requirements for NOx and VOC are only applicable to Chinese ships engaged on domestic voyages.

It is reminded that the special requirements relating to shore power also apply to ships engaged on international voyages (unless equivalent measures are used): it is required that from 1 July 2019, existing ships (other than tankers) equipped with shipborne devices of ship shore power system should use shore power if they berth for more than 3 hours in berths with shore power supply capacity in the coastal control areas (for inland river control area, berth for more than 2 hours); From 1 January 2021, cruise ships should use shore power when berthing for more than 3 hours in a berth with onshore power supply capacity in the emission control area.

Refer to the Plan for detailed emission control requirements and implementation plans.

1.2 Summary of SOx implementation requirements of the Plan

In the Plan, the implementation plan of SOx emission control requirements are summarized in Table 1 below:

Table 1: Sulphur Oxide Emission Control Schedule ①②③

Ship type		Sulphur content of fuel oils≤（% m/m）④	Coastal control areas		Inland control areas
			Hainan Waters	Other waters	
Seagoing ships		0.50	From 2019.1.1		
		0.10	From 2022.1.1	From 2025.1.1 (To be evaluated)	From 2020.1.1
River-sea ships		Using fuel oils in accordance with the requirements of the newly revised national standard for marine fuel oils	From 2019.1.1		
Inland ships	Large inland ships⑤		——	——	From 2019.1.1
	Other inland ships	General diesel oils in accordance with GB 252 standard⑥	——	——	From 2019.1.1

Note:① if the contents of this Table are inconsistent with the Chinese version and the official English version of the Plan issued by the Ministry of Transport, the official version of the Ministry of Transport shall prevail.

② Applicable to ships navigating, berthing or operating in the emission control areas, including ships engaged on international voyages, domestic coastal voyages and inland voyages.

③ From October 1, 2018 (inclusive) to January 1, 2019 (excluding), seagoing ships navigating or berthing at Shanghai port, Suzhou port, Nantong port and Zhoushan port of Ningbo are to use fuel oils with a sulphur content≤0.50%; October 1, 2018 (inclusive) -- January 1, 2019 (exclusive), inland ships and river-sea ships are to use fuel oil that meets relevant requirements; if the use of 0.50% low-sulphur fuel oil will pose a risk to the safety of the ship or there is no effective access to the low-sulphur fuel oil that meets the requirements, the ship may file waivers or exemptions with the maritime administration in advance. This is a regional regulation. If it is inconsistent with the Plan, the interpretation by the relevant maritime administration shall prevail.

④ From March 1, 2020, ships may only bunker and use the fuel oils specified in this column (unless alternative measures are taken). Alternative measures include the use of shore power, clean fuels such as LNG, and exhaust gas post-treatment systems, but should be approved.

⑤ For the definition of "large", refer to the newly revised national standard for marine fuel oils (to be released soon).

⑥ According to the information released by the Chinese government, GB 252 will be abolished, and at that time the new official standard will be implemented duly (http://www.sac.gov.cn/gzfw/zqyj/201811/t20181126_343202.htm).

2 Types, safety impacts and control measures of compliant fuel oils

2.1 Types of compliant fuel oils

In order to meet the sulphur content limits of fuel oils (e.g., 0.10% and 0.50%) requirements of the Plan, the types of marine fuel oils that can be selected and used generally are shown in Table 2 below:

Table 2: Optional and usable marine fuel oils

Sulphur content limits of fuel oils (%m/m)	Types of fuel oils	Applicable standards for marine fuel oils	Description
0.10	Marine distillate fuels	ISO 8217	Marine distillate fuels (such as DMA, DMZ, DMB) as specified in ISO 8217, are the main source of fuel oil with a sulphur content not exceed 0.10%
	Biodiesel	ISO 8217	Three types of biodiesel DFA, DFZ and DFB have been introduced in ISO 8217:2017, specifying that the volume percentage of added fatty acid methyl ester (FAME) volume is not to exceed 7%
	0.10% "blended fuel"	None	Entering the fuel supply market in 2015, can be bunkered in some ports
0.50	Low sulphur heavy fuel oil (LSHFO)	ISO 8217	The sulphur content of crude oil is relatively low, and the sulphur content of marine heavy fuel oil produced by distillation process is generally 0.30-0.80%, and the market supply is not large
	0.50% "blended fuel"	None	Mixture of distillate and heavy oil is expected to be the main source of compliant fuel supply in 2020 when IMO global 0.50% fuel standards are implemented

2.2 Safety impacts and control measures of compliant fuel oils

(1) Low sulphur distillate fuel

In order to produce such low sulphur distillate fuels, oil refineries often desulphurize fuel oils with special technologies and procedures, leading to significant changes to many characteristics of low sulphur distillate fuels. Since the fuel oil system and machinery installations of ships are normally designed for heavy fuel oil/marine diesel oil and there is less experience in the use of low sulphur distillate fuels, the changeover to low sulphur distillate fuels will possibly cause failure of the fuel oil system and equipment or even the risk of losing power for the ship.

China Classification Society has studied the characteristic changes and safety effects of low sulphur distillate fuels, and developed the *Guidelines for Use of Low Sulphur Distillate Fuels in Ships* on the basis of the research results (http://www.ccs.org.cn/ccswz/font/fontAction!article.do?articleId=4028e3d66545a2fa0165c6865851013a), which have supplemented special requirements for the design, arrangement, control and monitoring, operation and test of the related systems and equipment on board.

Table 3 below gives a brief overview of safety considerations and control measures of low sulphur distillate fuels and, so as to facilitate the understanding and use of the Guidelines.

Table 3: Safety considerations and Control Measures for using Low Sulphur Distillate Fuels

Influence factor	Risks and impacts	Control measures	Paragraphs of the Guidelines
Sulphur content	Cross-contamination of fuel oils with different sulphur content (such as HFO and low sulphur distillate fuel) will lead to non-compliance with requirements of regulations and rules	（1） Fuel oil tank and fuel oil system to be separated （2） Fuel oil tank and fuel oil system to be flushed （3） Design and arrangement of return oil pipes	2.2.1, 2.3.1, 2.3.4, 2.4.2, 2.5.5, 2.5.6
	Mismatch of the cylinder oil	（1） Selecting the appropriate type of	3.2.1, 3.2.2,

Influence factor	Risks and impacts	Control measures	Paragraphs of the Guidelines
	alkalinity used in diesel engine with the sulphur content of fuel oil will lead to combustion chamber corrosion or cylinder scraping	cylinder oil （2） Design and arrangement of cylinder oil system （3） Lubricating oil changeover and inspection to be carried out according to the specified procedures	3.2.3, 4.2.3
Viscosity	Low viscosity will lead to difficulties in oil film establishment (especially for marine distillate fuel) while serious wear and internal leakage of fuel pump will lead to diesel oil supply failure	（1） Avoiding low sulphur distillate fuels from being heated （2） Fuel oil cooling （3） Determining the suitability of HFO pumps to low sulphur distillate fuel	2.3.5, 2.5.3, 2.5.4, 2.5.7, 2.6.1, 3.4, etc.
Pour point	Under low temperature environment, the fuel oil with poor cold flow characteristics is prone to wax formation, resulting in blockage and other faults	（1） The surface temperature of coolers is to be maintained above the pour point of fuel oil （2） Confirming that the cold flow characteristics are suitable for design and intended voyage before refueling	2.5.3(3), Appendix 2 and Appendix 3
Flash point	Low flash point and volatile oil gas will lead to fire or explosion	（1） Flash point is not lower than SOLAS requirements	2.1.1 and 3.3
Compatibility and stability	Incompatible fuel oil mixture may form sludge or cause asphalt precipitation, resulting in filter and oil separator blockage as well as fuel supply failure	（1） Fuel oil tank and fuel oil system to be separated （2） Compatibility test to be conducted before refueling	2.2.1, 2.3.1, 2.3.4 and 2.1.2（1）
Catalyst fines	Too many catalyst fines may lead to serious wear and tear of fuel oil pump, fuel oil valve, nozzle and fuel supply failure	（1） Fuel oil treatments such as purification and filtration, regular cleaning of filters （2） Monitoring the quantity of fuel oils	2.1.2（2） and （3）
Calorific value	Variation of boiler steam generating capacity and diesel engine power output	（1） Design, arrangement and control system	3.3
Fuel oil changeover procedures	Excessive gradient of temperature change during changeover will cause thermal shock to fuel oil components	（1） Developing fuel changeover procedures and controlling the temperature gradient during fuel oil changeover not exceeding 2℃/min （2） Using specialized automatic fuel oil changeover device	4.2.1, 4.2.2 and 4.2.4

(2) Biodiesel/Biofuels

Biodiesel, a commonly used term for distillate containing fatty acid methyl ester (FAME) in the industry, is a type of biofuel. For the definition of biofuels, refer to MEPC.240(65) or MEPC.1/Circ.761/Rev.1, which has many applications in the automotive field. In the marine fuel oil field, ISO 8217: 2012 standard banned the addition of FAME (no more than 0.1%). Due to the tight supply of marine distillate fuels in some regions and ports, in order to meet the increased demand of fuel oil with 0.1% m/m sulphur content, marine distillate fuel blended with FAME (biodiesel) was also introduced in marine fuel oil supply market. ISO 8217: 2017 standard adds three new types of distillate fuels (DFA, DFZ and DFB), specifying that the volume

percentage of blended FAME is not to exceed 7%.

Except for the FAME concentration requirement, the other specifications of DFA, DFZ and DFB are same as those of DMA, DMZ and DMB respectively. Therefore, when this kind of distillate fuel blended with FAME is used on board, the requirements for storage, handling and use are basically the same as those for marine diesel oil (DMA, DMZ and DMB).

However, due to the properties of FAME such as oxidation, biodegradation, cleaning of deposits in fuel oil tanks and system, additional considerations are to be given when using such fuel on board. Regarding the use of this fuel, International Council on Combustion Engines (CIMAC) has developed the "*Guideline for ship owners and operators on managing distillate fuels up to 7.0% v/v FAME (biodiesel)*" for reference, which can be downloaded from the link address provided in this Notice part 6(1).

The following is a brief overview of the precautions for the use of biodiesel. Please refer to the CIMAC guideline above for details:

- Checking with the engine and other equipment manufacturers to confirm the compatibility of biodiesel blends, including manufacturers of the oily water separator plant, overboard discharge monitors, etc.;
- Avoiding storage periods over six months;
- A fuel condition monitoring programme is to be put in place if the fuel is intended for long term storage of 6 months or more, involving drawing samples and analyzing periodically (recommended every 3 months) and checking the acid number and oxidation stability of the fuel;
- Taking measures to prevent the water accumulation in fuel oil tanks, such as regular draining (at least twice daily);
- Monitoring the fuel storage tanks for water content and microbial contamination.
- For high pressure common rail fuel injection systems, the equipment manufacturer's guidelines on using biodiesel are to be specifically adhered;
- Monitoring fuel filter condition;
- Keeping the fuel storage temperature at least 10℃ above the pour point to prevent formation of wax. For ships intending to operate in cold zones, the specific cold flow requirements for fuel oils are to be included in the bunker purchasing contract.

(3) 0.1% "blended fuel"

At the end of 2014, in order to meet the market demand of 0.1% m/m sulphur content fuel oils, some fuel suppliers developed and introduced new 0.1% "blended fuel",

which improved the viscosity, lubricity and other characteristics by blending a small amount of heavy fuel oil in low sulphur distillate fuel. The main advantages of this low sulphur “blended fuel” are: its viscosity, lubricity and other characteristics are similar to the traditional heavy fuel oil, and it needs to be heated when storing, purifying and using onboard ships, and in general, the fuel oil system and fuel oil combustion units can be used without modification. However, as every fuel supplier has designed its own unique formulation, the properties of “blended fuel” vary significantly, which means that each “blended fuel” has its own specifics in terms of storing, handling and using the fuel, the fuel supplier is to be consulted for recommendations for use on board when purchasing. In addition, in view of the limited experience in using this “blended fuel” and the fact that the various marine fuel oil specifications (DM and RM) stipulated in the current ISO 8217 standard are still difficult to cover this kind of fuel, when a ship purchases and uses this kind of fuel, it is also to seek guidance and suggestions from the manufacturers of diesel engines, boilers, oil separators and other equipment.

The position paper “*New 0.10% sulphur marine (ECA) fuels*”, published by International Council on Combustion Engines (CIMAC), describes the compatibility and stability, viscosity, density, ignition quality, pour point, cat fines and sediment of this low sulphur “blended fuel”, and puts forward the technical points in the course of storage, treatment and use on board for the reference of ship owners/ship operators. The position paper can be downloaded from the link address provided in this Notice part 6(2).

In the storage and use of this low sulphur "blended fuel" on board the ship, the following technical points are recommended for consideration:

- In order to prevent incompatibility in the process of storage and use on board, it is suggested that a separate fuel oil system be used, and HFO tank be thoroughly cleaned before storing low sulphur "blended fuel".
- Due to the cold flow properties of low sulphur "blended fuel", permanent heating of the fuel may be necessary to minimize the risk of wax formation for storage onboard;
- The “blended fuel” needs onboard cleaning. Separator temperature and settings are to be adjusted to the viscosity and density of low sulphur "blended fuel";
- The heating temperature of fuel is to be adjusted according to its viscosity to prevent overheating;
- Switching between low sulphur "blended fuel" and HFO in accordance with fuel change-over procedures and controlling temperature gradient change to minimize risk of thermal shock;
- Adjusting the type and feeding rate of cylinder oil in accordance with the requirements of the equipment manufacturer.

(4) 0.50% “blended fuel”

In order to meet the market demand of fuel oil with 0.5% m/m sulphur content, especially the demand for IMO global 0.50% low sulphur fuel oil standard implementation on January 1, 2020, 0.50% "blended fuel" may become the most important supply source in the future. However, 0.50% "blended fuel" from different regions and suppliers may vary greatly in fuel mixing proportion, composition and process, and the corresponding fuel properties may also vary greatly, which will increase the probability of various accidents.

In view of that fact that this 0.50% " blended fuel" supply is scarce in the market and lack of experience, it is difficult to determine whether or not its characteristics are in full compliance with internationally recognized standard ISO 8217, the International Organization for Standardization (ISO) is developing new standards for this 0.50% " blended fuel".

For the treatment of this type of fuel oil, refer to the recommendations issued by CIMAC (*Recommendations Concerning the Design of Heavy Fuel Treatment Plants for Diesel Engines*), which can be downloaded from the link address provided in this Notice part 6(3).

For ease of reference, Table 4 below provides a brief overview of possible property changes and safety impacts of 0.50% "blended fuel":

Table 4: Possible Property Changes and Safety Impacts of 0.50% "Blended Fuel"

Properties of fuel oils	Potential impacts	Recommendations
Stability	Receiving, storing or treating unstable fuel on board may accumulate residue in storage tanks, resulting in clogging of fuel oil system, oil separator and filter	The producer is to verify the stability of fuel oil The purchaser is to seek for recommendations on storage, treatment and use of the fuel oil on board, such as storage conditions, storage period, etc.
Stability or compatibility	Incompatibility between the two fuel oils may result in sludge or precipitation of asphaltenes, and lead to clogging of fuel oil system, oil separator and filter	The two types of fuel oils are to be kept segregated during refueling and storage as much as possible. Special attention is to be paid to the incompatibility risk of the two types of fuel oils in the treatment and use on board. In addition, the incompatibility test before refueling or use on board is also an important measure to reduce the risk impact
Sulphur content	After the sulphur content of fuel is reduced from 3.50% to 0.50%, the mismatch of the cylinder oil used on board will result in the formation of a very hard sediment layer on the surface of piston and cylinder liner with the surplus alkaline substances in the lubricating oil, and will lead to the aggravation of cylinder scraping or wear	Consulting the recommendations of the product manufacture, and selecting the appropriate cylinder oil type for the type of diesel engine (such as two stroke and four stroke) (generally selecting the cylinder oil with BN number less than 40)
Acid value	Too high acid value may aggravate the damage of diesel engine, especially the components of fuel injection system	Paying attention to the acid value index of fuel oil and avoiding buying the fuel oil with too high acid value as far as possible. If the fuel oil with excessive acid value has been purchased on board, close attention is to be paid to the corrosion condition of diesel engine combustion equipment when using.

Properties of fuel oils	Potential impacts	Recommendations
Flash point	Low flash point will lead to risk of fire or explosion	Verifying that the flash point of fuel oil not exceeding 60 ^{0}C as per ISO 8217 standard (Required by SOLAS)
Catalyst fines	Too high levels of catalyst fines will lead to abrasive wear of cylinder liner, piston ring and fuel oil injection system	The requirements of engine manufacturer for catalyst fines are strictly higher than those of ISO 8217 standard, which is normally 10-15ppm. Attention is to be paid to the treatment measures of fuel purification, filtration and so on when the fuel is used on board, so as to ensure that the fuel quality requirement of the equipment manufacturer can be met.
Pour point	If the temperature is lower than the pour point, wax will form in the fuel, clog the filter, deposit on the bottom of the fuel tank, deposit on the surface of heat exchanger or heating coil, etc.	Properly heating the fuel during storage on board to maintain the appropriate temperature
Viscosity and density	Mismatch between the heating temperature and the setting of the separator will affect the quality of the fuel purification.	The viscosity of 0.50% "blended fuel" is generally in the range of 10-180cSt. The heating temperature and the setting of oil separator are to be adjusted according to its viscosity and density to ensure that the quality of fuel purification meets the requirements of fuel equipment.
Blended with unusual ingredients	Fuel oil mixed with high polymer, polymethacrylate, phenolic compounds, Anil oil, chlorinated hydrocarbons, organic acids and other substances will result in filter blockage, fuel pump seizured, corrosion and other faults	At present, it is not clear where these unusual ingredients mixed in the fuel come from and how harmful they are (possible sources are: residual by-products in crude oil refining, shale oil and some additives in the refining process, etc.). Some of the indicators have not yet been included in ISO standard.

3 Marine SOx emission control solutions and rule systems

3.1 Solutions

The following solutions are generally available for ships to meet SO_x emission requirements of conventions/regulations:

(1) Pretreatment of fuel oils: using special process to desulfurize fuel oils and the ship directly uses low sulphur fuel oil complying with the requirements, e.g. using low sulphur distillate fuel, biodiesel, blended fuel, etc.;

(2) After-treatment of exhaust gas: removing the SO_x in the exhaust gas by installing exhaust treatment device so as to achieve emission reduction equivalent to that of using low sulphur fuel oil, e.g. installing EGC system;

(3) Alternative fuels: ships use clean fuels such as natural gas. Due to low sulphur content of natural gas fuel, SO_x emission is very low after combustion.

Advantages and potential problems of the above three SOx options are listed in Table 5:

Table 5: Advantages and potential problems of three SOx emission control solutions

Control method	Optional techniques	Main advantages	Potential problems
Pretreatment	Low sulphur fuel	• no need of modifying	• high operation cost on fuel • availability of 0.5% fuel oil in

Control method	Optional techniques	Main advantages	Potential problems
	oil	equipment and system • safe and reliable	every port cannot be ensured • safety in using blended fuel cannot be ensured
After-treatment	EGC	• HFO can be used • low operation cost on fuel	• spaces taken by scrubber and alkali solution storage tank • difficult to modify existing ships • high cost of installing new equipment and system • lack of sufficient EGC residue reception facilities in ports
Alternative fuels	LNG fuel	• clean • low operation cost on fuel	• high safety requirements • LNG fuel tank taking too much cargo space • it is difficult to modify existing ships • inadequate fuel bunkering infrastructures

3.2 Rule/regulation standard system

For the three SOx emission control solutions, CCS has already established a complete rule/regulation standard system, as shown in Table 6 below. On one hand, for class safety, technical requirements for safe application of low sulphur fuel, EGCS and clean fuel on board have been developed, as a supplement to the primary class rules; on the other hand, for compliance of emission requirements, corresponding statutory survey requirements have been developed.

Table 6: CCS standard system for three SOx emission control options

	Low sulphur fuel oil	EGCS	Clean fuel
Class safety	*Guidelines for use of low sulphur distillate fuels in ships*	*Guidelines for design and installation of exhaust gas cleaning systems* Note	*Rules for natural gas fuelled Ships* Note Guidelines for ships using alternative fuels Note
Statutory requirements	International/domestic regulations	*International/domestic regulations* *Guidelines for test and survey of exhaust gas cleaning systems* Note	International/domestic regulations *Interim rules for statutory surveys of natural gas fuelled ships, 2018* Note

Note: Download links are listed in part 5 of this Notice- List of relevant documents.

3.3 Application of EGCS onboard ships

Exhaust gas cleaning system uses wet cleaning agent to reduce SOx in the exhaust gas from fuel oil equipment onboard ships, to achieve equivalent emission reduction effect as low sulphur fuel oil. EGC system can be categorized into 3 types according to its working mode, i.e., open loop type, closed loop type, and hybrid type.

It is accepted in MARPOL Annex VI that ships use EGCS as an alternative measure to meet SOx emission control requirements. However, different states/regions may

have special provisions on alternative measures of controlling SOx emission. Therefore, if EGCS is to be used, attention is to be paid to special requirements of the intended navigational areas, especially to the requirements of EU directives, USA CARB, and the Maritime & Port Authority of Singapore (MPA) regulations.

(1) EU Directive (Directive 2012/33/EU) permits to use EGCS as an alternative measure to control SOx emission, but it should operate in closed loop mode (Article 3a). Therefore, for ships installed with open loop type EGCS, they should timely switch to compliant fuels before entry into waters covered by the EU Directive and stop the operation of EGCS; for ships installed with hybrid type EGCS, they should timely switch to the closed loop mode before entry into the waters covered by the EU Directive. Relevant fuel changeover or EGCS working mode switching operations should be recorded as required.

(2) CARB regulations (13 CCR, section 2299.2) do not allow using EGCS as an alternative measure to control SOx emission (and temporary exemption is only given to emission reduction technique/method in the test and research stage). For ships installed with EGCS, before entry into waters covered by CARB regulations (within 24 n miles from coast), they should timely switch to the compliant MGO or MDO and stop EGCS. Relevant switching operations are to be recorded as required.

(3) According the news released by MPA, for open-loop exhaust gas scrubbers (open-loop EGCS)，the discharge of wash water from open-loop EGCS fitted onboard the ship in Singapore port waters will be prohibited from 1 January 2020. These ships fitted with hybrid EGCS should be switched to closed loop mode while in Singapore waters or be switched to the compliant MGO or MDO.

4 Latest technical information of implementing 0.50% low sulphur fuel oil standard

In 2016, IMO decided at MEPC70 that 0.50% low sulphur fuel oil standard will be implemented on 1 January 2020. To ensure effective and uniform implementation of this emission standard, IMO developed a work plan to carry out work in the following aspects: preparation for fuel oil changeover, method of compliance verification, safety of usage of 0.50% low sulphur fuel oil, non-availability report of compliant fuel, demands on revision of fuel standards, etc., proposing to amend relevant conventions and develop relevant guidance notes/guidelines, etc. Several international organizations and industrial associations also actively developed guidance documents on implementation of 0.50% low sulphur fuel oil. The followings is brief introduction of technical trends of IMO, ISO and ICS, for reference by interested parties.

4.1 Prohibition on the carriage onboard of fuel oil of more than 0.50% sulphur content

IMO adopted on 26 October 2018 the Amendments to MARPOL Annex VI by MEPC Resolution.305 (73), to revise the requirements of Regulation 14.1 into: The sulphur

content of fuel oil used or carried for use on board a ship shall not exceed 0.50% m/m. This requirement will take effect from 1 March 2020, till then non-compliant fuel oil will be prohibited to be carried onboard for combustion purposes for propulsion or operation onboard a ship unless an alternative method is used. (e.g. installation of EGCS). Relevant resolution is shown in Attachment 2.

4.2 Provision of sampling points for fuel oil used board ships

After implementation of the 0.50% low suphur fuel oil standard on 1 January 2020, sampling and analysis of the fuel oil used onboard is an important method to verify compliance of SOx emission from ships. For this purpose, appropriate sampling points need be arranged for the fuel oil system onboard ships to facilitate sampling of fuel oil used onboard ships. IMO is intended to adopt the revised MARPOL Annex VI, specifying that one or more separate sampling points should be provided onboard ships for sampling of fuel oil. The arrangement of sampling points should fulfil the requirements of the *Guidelines for Onboard Sampling for the Verification of the Sulphur Content of the Fuel Oil Used on board Ships* (MEPC.1/Circ.864 and the draft amendments, as provided in Attachment 3, which is under further revision by IMO and CCS will release relevant information in a timely manner).

4.3 Guidance on development of ship implementation plan

In order to help ship owners/ship managers to prepare for the implementation plan for implementation of the 0.50% sulphur limit, IMO adopted, on 9 November 2018, MEPC.1/Circ.878: *Guidance on the development of a ship implementation plan for the consistent implementation of the 0.50% sulphur limit under MARPOL Annex VI* (as shown in Attachment 4), encouraging owners/managers to develop individual ship implementation plans (although not mandatory) by making reference to this Circular, specify detailed plans and procedures in each stage and implement in strict compliance with these specified plans and procedures. This Circular suggests considering the following six aspects:

(1) risk assessment and mitigation plan. To carry out detailed risk assessment and develop appropriate risk control action and plan, considering the influence of the fuel oil intended to be used, e.g. segregation of different types of fuel, verification procedure for fuel oil compatibility, fuel oil system, fuel oil equipment, etc.;

(2) fuel oil system modifications and tank cleaning. To develop detailed action plan according to the identified need of modification of fuel oil segregation, fuel oil system, fuel oil tank and fuel oil equipment;

(3) fuel oil capacity and segregation capability; tank intended to store 0.50% sulphur limit fuel oil and total capacity, tank intended to store 0.10% sulphur limit fuel oil and total capacity;

(4) procurement of compliant fuel. To develop fuel oil procurement and bunker plan according to the type of the fuel oil intended to be used;

(5) fuel oil changeover plan. To develop a ship-specific fuel changeover plan and

procedure for HFO and 0.50% sulphur compliant fuel oil;

(6) documentation and reporting. The ship should carry onboard relevant documents and reports, including drawings and documents concerning modification of fuel oil tank, fuel oil system and fuel oil equipment, ship implementation plan and relevant records, and fuel oil non-availability report.

4.4 Fuel oil non-availability report（FONAR）

IMO is developing a standard form of fuel oil non-availability report (as the appendix to the draft *Guidance on the Development of A Ship Implementation Plan for the Consistent Implementation of the 0.50% Sulphur Limit Under MARPOL Annex VI*, refer to attachment 5). Management companies/ship owners and chief engineers should know in which condition FONAR is to be used, how to prepare and fill FONAR (especially evidences of taking efforts to obtain compliant fuel oil), to whom FONAR will be submitted (in general to the flag state Administrations and relevant port authorities), and period of retention of a copy of FONAR onboard.

The standard form of FONAR (draft) is given in Attachment 5.

4.5 Best practices for fuel oil quality control

IMO established a fuel oil quality correspondence group, planning to develop Best Practices for those involved in fuel oil quality control, including member states/coastal states, suppliers and purchasers/users. It is intended to control fuel oil quality from three aspects: fuel oil production, supply and bunkering, to ensure the safety and compliance of fuel oil used onboard ships. On 9 November 2018, IMO approved the *Guidance on Best Practice for Fuel Oil Purchasers/Users for Assuring the Quality of Fuel Oil Used on Board Ships* (MEPC.1/Circ.875/Add.1, as shown in Attachment 6).

4.6 Revision of ISO 8217 standard

In order to ensure the quality of blended fuel oil and its safe usage onboard, ISO is devoted to revising ISO 8217. But according to the ISO standard revision procedure, the 7th edition of ISO 8217 will be released in year 2022/23 (the 6th edition was released in 2017). Therefore, ISO plans to, by the end of 2019, temporarily release PAS（Publically available specification）23263: *Guidelines for fuel suppliers and users regarding marine fuel quality considering the implementation of maximum 0.50%S in 2020, specifying the quality index and usage of blended fuel oil*. Relevant parties are recommended to pay attention to this document.

4.7 Provisional guidance for compliance with 2020“Global Sulfur Cap”（ICS）

Based on the latest information gathered, ICS developed a provisional *guidance for compliance with 2020 Global Sulfur Cap*, assisting shipping companies and crew on preparing for the implementation of 0.50% fuel oil standard. This document provides guidance regarding selection of compliance fuel oil, properties of blended fuel oil, properties of distillate fuels, ship specified implementation plans, bunkering and fuel

oil non-availability, for reference by ship managers and crew.

The document can be downloaded via the link provided in paragraph 6(4) in this Notice.

5 List of relevant documents

（1） Attachment 1: *Implementation Plan for Marine Air Pollutant Emission Control Area* (download link: http://www.msa.gov.cn/html/xinxichaxungongkai/gkml/wgfw/tzggwgfw/20181210/552CD0E5-0969-48D6-BF44-78F6720A7528.html)

（2） Attachment 2: MEPC Resolution.305(73)- Amendments to MARPOL Annex VI - *Prohibition on the carriage of non-compliant fuel oil for combustion purposes for propulsion or operation on board a ship*

（3） Attachment 3 (including the draft amendments): MEPC.1/Circ.864 - *Guidelines for Onboard Sampling for the Verification of the Sulphur Content of the Fuel Oil Used on board Ships*

（4） Attachment 4: MEPC.1/Circ.878 - *Guidance on the Development of A Ship Implementation Plan for the Consistent Implementation of the 0.50% Sulphur Limit Under MARPOL Annex VI*

（5） Attachment 5: fuel oil non-availability report, FONAR – As the appendix to the draft MEPC.1/Circ.XXX - *Guidance on the Development of A Ship Implementation Plan for the Consistent Implementation of the 0.50% Sulphur Limit Under MARPOL Annex VI*

（6） Attachment 6: MEPC.1-Circ.875/Add.1- *Guidance on best practice for fuel oil purchasers/users for assuring the quality of fuel oil used on board ships*

（7） *Guidelines for use of low sulphur distillate fuels in ships* (2018) (download link: http://www.ccs.org.cn/ccswz/font/fontAction!article.do?articleId=4028e3d66545a2fa0165c6865851013a)

（8） *Guidelines for design and installation of exhaust gas cleaning systems* (download link: http://www.ccs.org.cn/ccswz/font/fontAction!article.do?articleId=4028e3d653e5c876015432c78f7103a5 ）

（9） *Guidelines for test and survey of exhaust gas cleaning systems* (download link: http://www.ccs.org.cn/ccswz/font/fontAction!article.do?articleId=4028e3d65746d5a10157b2d352440326 ）

（10）*Rules for natural gas fuelled Ships* (download link: http://www.ccs.org.cn/ccswz/font/fontAction!article.do?articleId=4028e3d6584bdcf90158898f6d940095;

http://www.ccs.org.cn/ccswz/font/fontAction!article.do?articleId=4028e3d65fa51da3015fdd32673f00f3;
http://www.ccs.org.cn/ccswz/font/fontAction!article.do?articleId=4028e3d6612c68240161c54151990199 ）

（11）*Guidelines for ships using alternative fuels* (download link: http://www.ccs.org.cn/ccswz/font/fontAction!article.do?articleId=4028e3d65fa51da3015fb80537a40014 ）

（12）*Interim rules for statutory surveys of natural gas fuelled ships, 2018* (download link: http://www.msa.gov.cn/html/xinxichaxungongkai/gkml/zhfw/TZGGzh/20180115/90AC22F0-5FC6-42B3-9F09-7ECCF52637D2.html ）

6 Reference documents published by relevant international organizations and download links

（1） CIMAC "*Guideline for ship owners and operators on managing distillate fuels up to 7.0% v/v FAME (biodiesel)*"

The document may be downloaded via the following link:

https://www.cimac.com/cms/upload/Publication_Press/WG_Publications/CIMAC_WG07_2013_Jul_Guideline_Managing_Distillate_Fuels.pdf

（2） CIMAC position paper "*New 0.10% sulphur marine (ECA) fuels*"

The document may be downloaded via the following link:

https://www.cimac.com/cms/upload/Publication_Press/WG_Publications/CIMAC_WG07_2015_Jun_Position_sulphur_marine_ECA_fuels.pdf

（3） CIMAC *Recommendations Concerning the Design of Heavy Fuel Treatment Plants for Diesel Engines*

The document may be downloaded via the following link:

https://www.cimac.com/publications/recommendations410/cimac-recommendation-no.-25.html

（4） ICS Compliance with the 2020 '*Global Sulphur Cap*'

The document may be downloaded via the following link:

http://www.ics-shipping.org/free-resources/2020-sulphur-compliance

7 Subsequent suggestions and services provided by CCS

It is suggested that involved parties should implement the requirements of the Plan, IMO requirements on low sulphur fuel oil and state/regional directives as required.

Considering that individual Administrations, especially China MSA may further develop implementation procedures to enhance inspection of applicable ships to verify their compliance, it is suggested that applicable ships establish and carry out relevant procedures, such as training procedure, bunkering procedure, fuel oil changover procedure, operational procedure, and record relevant data as required (e.g. the date/time of starting and completing oil changeover or using post-treatment system, usage amount, latitude and longitude of the ship, etc.). The crew is to be familiar with these requirements in advance and is able to be proficient in operating. Relevant support documents, such as bunker delivery note, oil record book, log and fuel oil samples should be kept on board ships, with attention paid to the retention period of relevant documents.

If compliant fuel oil cannot be purchased timely or is not sold in local areas, or the ship has to use non-compliant fuel oils due to machinery fault or equipment failure, etc., the ship should timely contact its flag State Administration and relevant port Authority to address it as early as possible. Relevant documents should be kept on board as evidence.

For ships using alternative measures such as clean fuel (e.g. LNG), exhaust gas post-treatment system (to be provided with product certificate), CCS will endorse (for ships in domestic voyages) relevant certificate or indicate in the certificate supplement (for ships in international voyages), or check in conjunction with the latest survey on prevention of air pollution. CCS auditors will also give attention to this issue during safety management system audit.

As for how to be comply with the Plan and IMO requirements on low sulpur fuel oil, CCS can provide consultancy for clients and provide survey and certification service upon request from the ship. For newbuildings and existing ships (conversion), CCS will actively cooperate with the clients to complete plan approval, survey and certification in a timely manner.

From the date of entry into force of the plan, this Notice supersedes Technical Notice(2015)No.39/Total No.200 and Technical Notice(2016) No. 3/Total No.205.

This Notice is made public on CCS website (www.ccs.org.cn), and CCS branches/plan approval centers are invited to transmit it to relevant shipyards/ship repairing yards, ship designers, ship owners, ship management companies and equipment manufacturers within their responsible areas.

Please contact Technical Management Department of CCS for any inquiry in the implementation. E-mail address: rt@ccs.org.cn

交通运输部文件

交海发〔2018〕168号

交通运输部关于印发船舶大气污染物排放控制区实施方案的通知

各省、自治区、直辖市、新疆生产建设兵团交通运输厅（局、委），各直属海事局，长江航务管理局、珠江航务管理局：

现将《船舶大气污染物排放控制区实施方案》印发给你们，请认真贯彻落实。

中华人民共和国交通运输部

交通运输部

2018年11月30日

（此件公开发布）

船舶大气污染物排放控制区实施方案

为深入贯彻落实党中央、国务院关于加快推进生态文明建设、打好污染防治攻坚战和打赢蓝天保卫战的部署，促进绿色航运发展和船舶节能减排，根据《中华人民共和国大气污染防治法》和我国加入的有关国际公约，在实施《珠三角、长三角、环渤海（京津冀）水域船舶排放控制区实施方案》（交海发〔2015〕177号）的基础上，制定本实施方案。

一、工作目标

通过设立船舶大气污染物排放控制区（以下简称排放控制区），降低船舶硫氧化物、氮氧化物、颗粒物和挥发性有机物等大气污染物的排放，持续改善沿海和内河港口城市空气质量。

二、设立原则

（一）促进环境质量改善和航运经济协调发展。

（二）强化船舶大气污染物排放控制。

（三）遵守国际公约和我国法律标准要求。

（四）分步实施和先行先试并举。

三、适用对象

本方案适用于在排放控制区内航行、停泊、作业的船舶。

四、排放控制区范围

本方案所指排放控制区包括沿海控制区和内河控制区。

沿海控制区范围为表1所列60个点依次连线以内海域，其中海南水域范围为表2所列20个点依次连线以内海域。

内河控制区范围为长江干线(云南水富至江苏浏河口)、西江干线(广西南宁至广东肇庆段)的通航水域，起止点位坐标见表3。

表1　沿海控制区海域边界控制点位坐标

序号	经　度	纬　度	序号	经　度	纬　度
1	124°10′06.00″	39°49′41.00″	31	112°50′52.80″	21°22′25.68″
2	122°57′14.40″	37°22′11.64″	32	112°29′20.40″	21°17′12.48″
3	122°57′00.00″	37°21′29.16″	33	111°27′00.00″	19°51′57.96″
4	122°48′18.00″	36°53′51.36″	34	111°23′42.00″	19°46′54.84″
5	122°45′14.40″	36°48′25.20″	35	110°38′56.40″	18°31′10.56″
6	122°40′58.80″	36°44′41.28″	36	110°37′40.80″	18°30′24.12″
7	122°24′36.00″	36°35′08.88″	37	110°15′07.20″	18°16′00.84″
8	121°03′03.60″	35°44′44.16″	38	110°09′25.20″	18°12′45.36″
9	120°12′57.60″	34°59′27.60″	39	109°45′32.40″	17°59′03.12″
10	121°32′24.00″	33°28′46.20″	40	109°43′04.80″	17°59′03.48″
11	121°51′14.40″	33°06′19.08″	41	109°34′26.40″	17°57′18.36″
12	122°26′42.00″	31°32′08.52″	42	109°03′39.60″	18°03′10.80″
13	123°23′31.20″	30°49′15.96″	43	108°50′42.00″	18°08′58.56″
14	123°24′36.00″	30°45′51.84″	44	108°33′07.20″	18°21′07.92″
15	123°09′28.80″	30°05′43.44″	45	108°31′40.80″	18°22′30.00″
16	122°28′26.40″	28°47′31.56″	46	108°31′08.40″	18°23′10.32″

序号	经　度	纬　度	序号	经　度	纬　度
17	122°07′30.00″	28°18′58.32″	47	108°28′44.40″	18°25′34.68″
18	122°06′03.60″	28°17′01.68″	48	108°24′46.80″	18°49′13.44″
19	121°19′12.00″	27°21′30.96″	49	108°23′20.40″	19°12′47.16″
20	120°42′28.80″	26°17′32.64″	50	108°22′45″	20°24′05″
21	120°36′10.80″	26°04′01.92″	51	108°12′31″	21°12′35″
22	120°06′57.60″	25°18′37.08″	52	108°08′05″	21°16′32″
23	119°37′26.40″	24°49′31.80″	53	108°05′43.7″	21°27′08.2″
24	118°23′16.80″	24°00′54.00″	54	108°05′38.8″	21°27′23.1″
25	117°50′31.20″	23°23′16.44″	55	108°05′39.9″	21°27′28.2″
26	117°22′26.40″	23°03′05.40″	56	108°05′51.5″	21°27′39.5″
27	117°19′51.60″	23°01′32.88″	57	108°05′57.7″	21°27′50.1″
28	116°34′55.20″	22°45′05.04″	58	108°06′01.6″	21°28′01.7″
29	115°13′01.20″	22°08′03.12″	59	108°06′04.3″	21°28′12.5″
30	114°02′09.60″	21°37′02.64″	60	北仑河主航道中心线向海侧终点	

表 2　海南水域的海域边界控制点位坐标

序号	经　度	纬　度	序号	经　度	纬　度
A1	108°26′24.88″	19°24′06.50″	33	111°27′00.00″	19°51′57.96″
A2	109°20′00″	20°07′00″	34	111°23′42.00″	19°46′54.84″
A3	111°00′00″	20°18′32″	35	110°38′56.40″	18°31′10.56″
			36	110°37′40.80″	18°30′24.12″
			37	110°15′07.20″	18°16′00.84″

序号	经　度	纬　度	序号	经　度	纬　度
			38	110°09′25.20″	18°12′45.36″
			39	109°45′32.40″	17°59′03.12″
			40	109°43′04.80″	17°59′03.48″
			41	109°34′26.40″	17°57′18.36″
			42	109°03′39.60″	18°03′10.80″
			43	108°50′42.00″	18°08′58.56″
			44	108°33′07.20″	18°21′07.92″
			45	108°31′40.80″	18°22′30.00″
			46	108°31′08.40″	18°23′10.32″
			47	108°28′44.40″	18°25′34.68″
			48	108°24′46.80″	18°49′13.44″
			49	108°23′20.40″	19°12′47.16″

表 3　内河控制区起止点位坐标

内河控制区	边界名称	地名	点位详细描述	点位序号	经　度	纬　度
长江干线	起点	云南水富	向家坝大桥	B1	104°24′30.60″	28°38′22.38″
				B2	104°24′35.94″	28°38′27.84″
	终点	江苏浏河口	浏河口下游的浏黑屋与崇明岛施翘河下游的施信杆的连线	B3	121°18′54.00″	31°30′52.00″
				B4	121°22′30.00″	31°37′34.00″
西江干线	起点	广西南宁	南宁民生码头	B5	108°18′19.77″	22°48′48.60″
				B6	108°18′26.72″	22°48′39.76″
	终点	广东肇庆	西江干流金利下铁线角与五顶岗涌口上咀连线	B7	112°48′30.00″	23°08′45.00″
				B8	112°47′19.00″	23°08′01.00″

图 1　排放控制区范围示意图

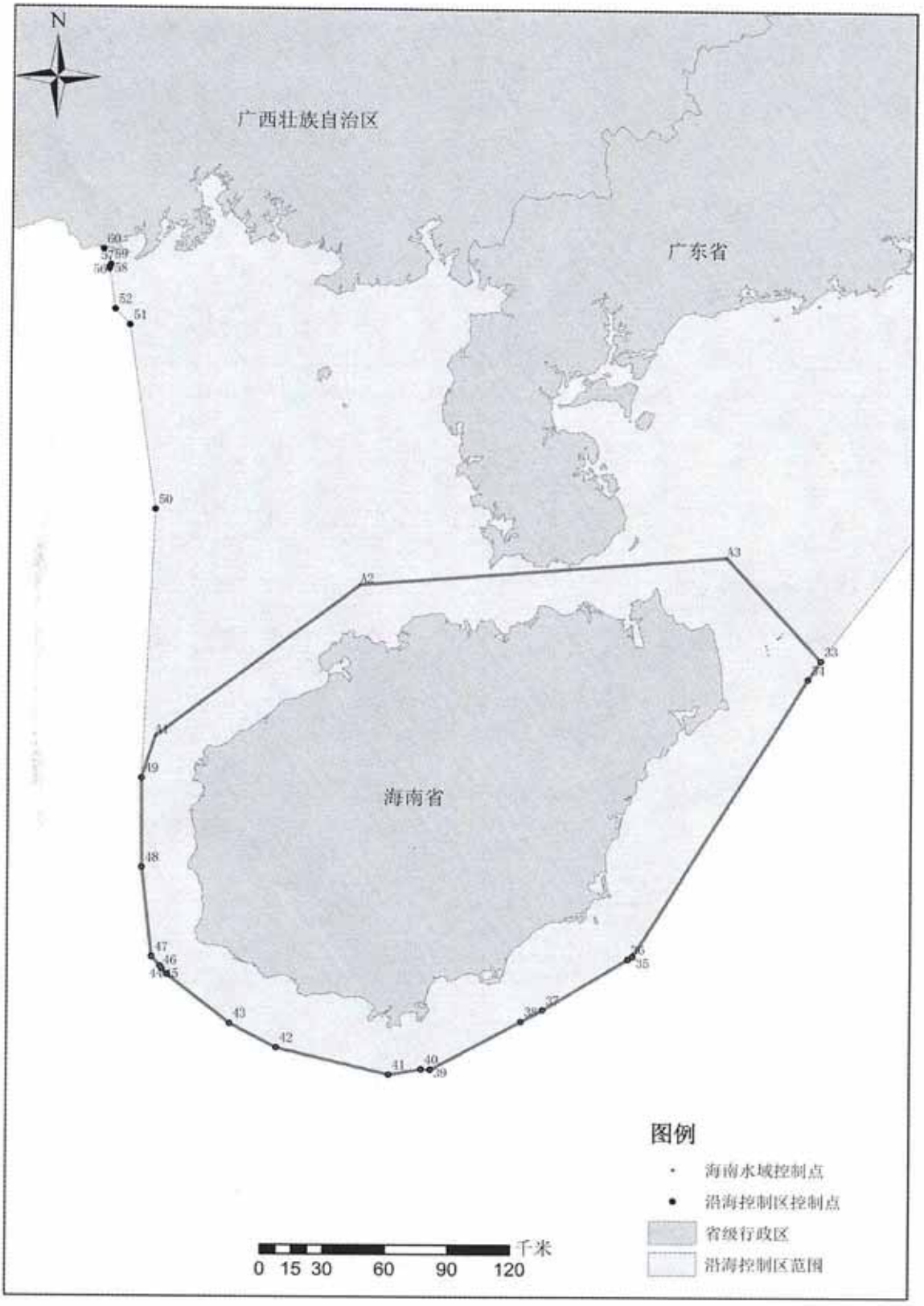

图 2　沿海控制区海南水域范围示意图

五、控制要求

（一）硫氧化物和颗粒物排放控制要求。

1.2019年1月1日起，海船进入排放控制区，应使用硫含量不大于0.5%m/m的船用燃油，大型内河船和江海直达船舶应使用符合新修订的船用燃料油国家标准要求的燃油；其他内河船应使用符合国家标准的柴油。2020年1月1日起，海船进入内河控制区，应使用硫含量不大于0.1%m/m的船用燃油。

2.2020年3月1日起，未使用硫氧化物和颗粒物污染控制装置等替代措施的船舶进入排放控制区只能装载和使用按照本方案规定应当使用的船用燃油。

3.2022年1月1日起，海船进入沿海控制区海南水域，应使用硫含量不大于0.1%m/m的船用燃油。

4.适时评估船舶使用硫含量不大于0.1%m/m的船用燃油的可行性，确定是否要求自2025年1月1日起，海船进入沿海控制区使用硫含量不大于0.1%m/m的船用燃油。

（二）氮氧化物排放控制要求。

5.2000年1月1日及以后建造（以铺设龙骨日期为准，下同）或进行船用柴油发动机重大改装的国际航行船舶，所使用的单台船用柴油发动机输出功率超过130千瓦的，应满足《国际防止船舶造成污染公约》第一阶段氮氧化物排放限值要求。

6.2011年1月1日及以后建造或进行船用柴油发动机重大改装的国际航行船舶，所使用的单台船用柴油发动机输出功率超

过130千瓦的，应满足《国际防止船舶造成污染公约》第二阶段氮氧化物排放限值要求。

7.2015年3月1日及以后建造或进行船用柴油发动机重大改装的中国籍国内航行船舶，所使用的单台船用柴油发动机输出功率超过130千瓦的，应满足《国际防止船舶造成污染公约》第二阶段氮氧化物排放限值要求。

8.2022年1月1日及以后建造或进行船用柴油发动机重大改装的、进入沿海控制区海南水域和内河控制区的中国籍国内航行船舶，所使用的单缸排量大于或等于30升的船用柴油发动机应满足《国际防止船舶造成污染公约》第三阶段氮氧化物排放限值要求。

9.适时评估船舶执行《国际防止船舶造成污染公约》第三阶段氮氧化物排放限值要求的可行性，确定是否要求2025年1月1日及以后建造或进行船用柴油发动机重大改装的中国籍国内航行船舶，所使用的单缸排量大于或等于30升的船用柴油发动机满足《国际防止船舶造成污染公约》第三阶段氮氧化物排放限值要求。

（三）船舶靠港使用岸电要求。

10.2019年1月1日及以后建造的中国籍公务船、内河船舶（液货船除外）和江海直达船舶应具备船舶岸电系统船载装置，2020年1月1日及以后建造的中国籍国内沿海航行集装箱船、邮轮、客滚船、3千总吨及以上的客船和5万吨级及以上的干散货船应具备船舶岸电系统船载装置。

11.2019年7月1日起，具有船舶岸电系统船载装置的现有船舶（液货船除外），在沿海控制区内具备岸电供应能力的泊位停泊超过3小时，或者在内河控制区内具备岸电供应能力的泊位停泊超过2小时，且不使用其他等效替代措施的（包括使用清洁能源、新能源、船载蓄电装置或关闭辅机等，下同），应使用岸电。2021年1月1日起，邮轮在排放控制区内具备岸电供应能力的泊位停泊超过3小时，且不使用其他等效替代措施的，应使用岸电。

12.2022年1月1日起，使用的单台船用柴油发动机输出功率超过130千瓦、且不满足《国际防止船舶造成污染公约》第二阶段氮氧化物排放限值要求的中国籍公务船、内河船舶（液货船除外），以及中国籍国内沿海航行集装箱船、客滚船、3千总吨及以上的客船和5万吨级及以上的干散货船，应加装船舶岸电系统船载装置，并在沿海控制区内具备岸电供应能力的泊位停泊超过3小时，或者在内河控制区内具备岸电供应能力的泊位停泊超过2小时，且不使用其他等效替代措施时，应使用岸电。

13.鼓励中国航运企业和经营人对拥有的第12条规定之外的船舶加装船舶岸电系统船载装置，并在排放控制区内具备岸电供应能力的泊位停泊时使用岸电。

（四）其他。

14.船舶可使用清洁能源、新能源、船载蓄电装置或尾气后处理等替代措施满足船舶排放控制要求。采取尾气后处理方式的，应当安装排放监测装置，产生的废水废液应当按照有关规定进行

处理。

15.鼓励其他内河水域所在的地方人民政府参照内河控制区的要求，对海船进入本水域所使用的燃油硫含量提出控制要求。

16.2020年1月1日及以后建造的150总吨及以上中国籍国内航行油船进入排放控制区，应具备码头油气回收条件，鼓励满足安全要求时开展油气回收。国际航行船舶应符合《国际防止船舶造成污染公约》关于挥发性有机物的排放控制要求。

17.船舶应严格执行其他现行国际公约和国内法律法规、标准规范关于大气污染物的排放控制要求。

六、保障措施

（一）加强组织领导。

各省级交通运输主管部门、各直属海事管理机构、长江航务管理局、珠江航务管理局要加强组织领导和协调，细化任务措施，明确职责分工，完善保障机制。部适时评估前述控制措施实施效果，确定是否调整排放控制区实施方案。

（二）强化联动监管。

各省级交通运输主管部门、各直属海事管理机构要认真落实《交通运输部等十三个部门关于加强船用低硫燃油供应保障和联合监管的指导意见》（交海发〔2017〕163号）等文件要求，建立联合监管机制，保障合规船用低硫燃油供应，加强船舶大气污染防治监督管理。

（三）注重政策引导。

各省级交通运输主管部门、各直属海事管理机构要积极协调

地方人民政府出台相关激励政策和配套措施，增加执法装备、人员培训等执法保障方面的投入，对使用低硫燃油、清洁能源、尾气后处理、油气回收、岸电、在线监测、提前淘汰老旧船舶等措施，采取资金补贴、便利通行等鼓励政策和措施。

（四）发挥科技支撑作用。

各省级交通运输主管部门、各直属海事管理机构、长江航务管理局、珠江航务管理局要积极引导和支持相关科研单位、港航企业和设备厂商等，开展船舶大气污染控制和监管技术研究，组织制定技术标准，促进成果转化。

抄送：外交部、国家发展改革委、工业和信息化部、公安部、财政部、生态环境部、商务部、应急部、海关总署、税务总局、市场监管总局、能源局，中国石油天然气集团公司、中国石油化工集团公司、中国海洋石油集团有限公司、中国远洋海运集团有限公司、招商局集团有限公司，各主要港口企业集团，中国船东协会、中国港口协会、中国石油流通协会船用燃料专业委员会，部属各单位，部内各司局。

交通运输部办公厅　　2018年12月6日印发

ANNEX

DRAFT MEPC RESOLUTION

AMENDMENTS TO THE ANNEX OF THE PROTOCOL OF 1997 TO AMEND THE INTERNATIONAL CONVENTION FOR THE PREVENTION OF POLLUTION FROM SHIPS, 1973, AS MODIFIED BY THE PROTOCOL OF 1978 RELATING THERETO

Amendments to MARPOL Annex VI

(Prohibition on the carriage of non-compliant fuel oil for combustion purposes for propulsion or operation on board a ship)

THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

RECALLING Article 38(a) of the Convention on the International Maritime Organization concerning the functions of the Marine Environment Protection Committee conferred upon it by international conventions for the prevention and control of marine pollution from ships,

NOTING article 16 of the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocols of 1978 and 1997 relating thereto (MARPOL), which specifies the amendment procedure and confers upon the appropriate body of the Organization the function of considering amendments thereto for adoption by the Parties,

HAVING CONSIDERED, at its seventy-third session, proposed amendments to MARPOL Annex VI concerning the prohibition on the carriage of non-compliant fuel oil for combustion purposes for propulsion or operation on board a ship,

1 ADOPTS, in accordance with article 16(2)(d) of MARPOL, amendments to MARPOL Annex VI, the text of which is set out in the annex to the present resolution;

2 DETERMINES, in accordance with article 16(2)(f)(iii) of MARPOL, that the amendments shall be deemed to have been accepted on [1 September 2019] unless prior to that date, not less than one third of the Parties or Parties the combined merchant fleets of which constitute not less than 50% of the gross tonnage of the world's merchant fleet, have communicated to the Organization their objection to the amendments;

3 INVITES the Parties to note that, in accordance with article 16(2)(g)(ii) of MARPOL, the said amendments shall enter into force on [1 March 2020] upon their acceptance in accordance with paragraph 2 above;

4 REQUESTS the Secretary-General, for the purposes of article 16(2)(e) of MARPOL, to transmit certified copies of the present resolution and the text of the amendments contained in the annex to all Parties to MARPOL;

5 REQUESTS FURTHER the Secretary-General to transmit copies of the present resolution and its annex to Members of the Organization which are not Parties to MARPOL.

ANNEX

AMENDMENTS TO MARPOL ANNEX VI

(Prohibition on the carriage of non-compliant fuel oil for combustion purposes for propulsion or operation on board a ship)

Regulation 14
Sulphur oxides (SO_X) and particulate matter

General requirements

1 Paragraph 1 is replaced by the following:

"1 The sulphur content of fuel oil used or carried for use on board a ship shall not exceed 0.50% m/m."

Requirements within emission control areas

2 Paragraph 4 is replaced by the following:

"4 While a ship is operating within an emission control area, the sulphur content of fuel oil used on board that ship shall not exceed 0.10% m/m."

3 The title "Review provision" and associated footnote, and paragraphs 8, 9 and 10 are deleted.

Appendix I

Form of International Air Pollution Prevention (IAPP) Certificate (Regulation 8)

Supplement to International Air Pollution Prevention Certificate (IAPP Certificate)

4 Paragraphs 2.3.1 and 2.3.2 are replaced by the following and a new paragraph 2.3.3 is added as follows:

"2.3.1 When the ship operates outside of an emission control area specified in regulation 14.3, the ship uses:

.1 fuel oil with a sulphur content as documented by bunker delivery notes that does not exceed the limit value of 0.50% m/m, and/or ……..... ☐

.2 an equivalent arrangement approved in accordance with regulation 4.1 as listed in paragraph 2.6 that is at least as effective in terms of SO_X emission reductions as compared to using a fuel oil with a sulphur content limit value of 0.50% m/m ……..... ☐

2.3.2 When the ship operates inside an emission control area specified in regulation 14.3, the ship uses:

.1 fuel oil with a sulphur content as documented by bunker delivery notes that does not exceed the limit value of 0.10% m/m, and/or

……☐

.2 an equivalent arrangement approved in accordance with regulation 4.1 as listed in paragraph 2.6 that is at least as effective in terms of SO_X emission reductions as compared to using a fuel oil with a sulphur content limit value of 0.10% m/m

……...……...☐

2.3.3 For a ship without an equivalent arrangement approved in accordance with regulation 4.1 as listed in paragraph 2.6, the sulphur content of fuel oil carried for use on board the ship shall not exceed 0.50% m/m as documented by bunker delivery notes

……...……☐"

ANNEX 5

DRAFT AMENDMENTS TO THE GUIDELINES FOR ONBOARD SAMPLING FOR THE VERIFICATION OF THE SULPHUR CONTENT OF THE FUEL OIL USED ON BOARD SHIPS (MEPC.1/CIRC.864)

(shown as additions/~~deletions~~)

1 Preface

The objective of these Guidelines is to establish an agreed method for sampling to enable effective control and enforcement of liquid fuel oil being used on board ships under the provisions of MARPOL Annex VI.

2 Sampling location

~~2.1~~ The on-board representative sample or samples should be obtained from a designated sampling point or points ~~as agreed by the Administration taking into account the criteria given in paragraphs 2.2.1 to 2.2.5 of these Guidelines~~. The number and location of designated fuel oil sampling points should be [confirmed][1] by the Administration following consideration of possible fuel cross-contamination and service tank arrangements. ~~2.2 In the absence of the sampling point or points referred to in paragraph 2.1, the fuel sampling point to be used should fulfil all of the following conditions:~~ Fuel sampling points to be used should fulfil all of the following conditions:

.1 be easily and safely accessible;

.2 take into account different fuel oil grades being used for the fuel oil combustion machinery item;

.3 be downstream of the in-use fuel oil service tank;

.4 be as close to the fuel oil combustion machinery as safely feasible taking into account the type of fuel oil, flow-rate, temperature, and pressure behind the selected sampling point;

.5 be clearly marked for easy identification and described in [~~the Oil Record Book and all other~~] relevant documents;

.~~5~~6 ~~the~~ each sampling point should be located in a position shielded from any heated surface or electrical equipment and the shielding device or construction should be sturdy enough to endure leaks, splashes or spray under design pressure of the fuel oil supply line so as to preclude impingement of fuel oil onto such surface or equipment; and

~~.6 be proposed by the ship's representative and accepted by the inspector; and~~

.7 the sampling arrangement should be provided with suitable drainage to the drain tank or other safe location.

[1] Note: ISWG-AP 1 agreed that the Administration is not expected to give approval/agreement; the term "confirmed" needs further discussion.

~~2.3 Fuel oil samples may be taken at more than one location in the fuel oil service system to determine whether there is a possible fuel cross-contamination in the absence of fully segregated fuel service systems, or in case of multiple service tank arrangements.~~

3 Sample handling

The fuel oil sample should be taken when a steady flow is established in the fuel oil circulating system. The sampling connection* should be thoroughly flushed through with the fuel oil in use prior to drawing the sample. The sample or samples should be collected in a sampling container or containers and should be representative of the fuel oil being used. The sample bottles should be sealed by the inspector with a unique means of identification installed in the presence of the ship's representative. The ship should be given the option of retaining a sample. The label should include the following information:

.1 sampling point location where the sample was drawn;

.2 date and port of sampling;

.3 name and IMO number of the ship;

.4 details of seal identification; and

.5 signatures and names of the inspector and the ship's representative.

***

* The sampling connection is the valve and associated pipework designated for sample collection which is connected to the fuel oil service system.

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MEPC.1/Circ.864
9 December 2016

GUIDELINES FOR ONBOARD SAMPLING FOR THE VERIFICATION OF THE SULPHUR CONTENT OF THE FUEL OIL USED ON BOARD SHIPS

1 The Marine Environment Protection Committee, at its seventieth session (24 to 28 October 2016), recognizing the need to establish an agreed method for sampling to enable effective control and enforcement of liquid fuel oil being used on board ships under the provisions of MARPOL Annex VI, approved the *Guidelines for on-board sampling for the verification of the sulphur content of the fuel oil used on board ships*, as set out in the annex.

2 Member Governments are invited to bring the annexed Guidelines to the attention of Administrations, industry, relevant shipping organizations, shipping companies and other stakeholders concerned.

***

ANNEX

GUIDELINES FOR ONBOARD SAMPLING FOR THE VERIFICATION OF THE SULPHUR CONTENT OF THE FUEL OIL USED ON BOARD SHIPS

1 Preface

The objective of these Guidelines is to establish an agreed method for sampling to enable effective control and enforcement of liquid fuel oil being used on board ships under the provisions of MARPOL Annex VI.

2 Sampling location

2.1 The on-board representative sample or samples should be obtained from a designated sampling point or points as agreed by the Administration taking into account the criteria given in paragraphs 2.2.1 to 2.2.5 of these Guidelines.

2.2 In the absence of the sampling point or points referred to in paragraph 2.1, the fuel sampling point to be used should fulfil all of the following conditions:

.1 be easily and safely accessible;

.2 take into account different fuel oil grades being used for the fuel oil combustion machinery item;

.3 be downstream of the in-use fuel oil service tank;

.4 be as close to the fuel oil combustion machinery as safely feasible taking into account the type of fuel oil, flow-rate, temperature, and pressure behind the selected sampling point;

.5 the sampling point should be located in a position shielded from any heated surface or electrical equipment and the shielding device or construction should be sturdy enough to endure leaks, splashes or spray under design pressure of the fuel oil supply line so as to preclude impingement of fuel oil onto such surface or equipment;

.6 be proposed by the ship's representative and accepted by the inspector; and

.7 the sampling arrangement should be provided with suitable drainage to the drain tank or other safe location.

2.3 Fuel oil samples may be taken at more than one location in the fuel oil service system to determine whether there is a possible fuel cross-contamination in the absence of fully segregated fuel service systems, or in case of multiple service tank arrangements.

3 Sample handling

The fuel oil sample should be taken when a steady flow is established in the fuel oil circulating system. The sampling connection* should be thoroughly flushed through with the fuel oil in use prior to drawing the sample. The sample or samples should be collected in a sampling container or containers and should be representative of the fuel oil being used. The sample bottles should be sealed by the inspector with a unique means of identification installed in the presence of the ship's representative. The ship should be given the option of retaining a sample. The label should include the following information:

.1 sampling point location where the sample was drawn;

.2 date and port of sampling;

.3 name and IMO number of the ship;

.4 details of seal identification; and

.5 signatures and names of the inspector and the ship's representative.

_____

* The sampling connection is the valve and associated pipework designated for sample collection which is connected to the fuel oil service system.

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MEPC.1/Circ.878
9 November 2018

GUIDANCE ON THE DEVELOPMENT OF A SHIP IMPLEMENTATION PLAN FOR THE CONSISTENT IMPLEMENTATION OF THE 0.50% SULPHUR LIMIT UNDER MARPOL ANNEX VI

1 The Marine Environment Protection Committee, at its seventy-third session (22 to 26 October 2018), approved the *Guidance on the development of a ship implementation plan for the consistent implementation of the 0.50% sulphur limit under MARPOL Annex VI*, as set out in the annex.

2 Member Governments are invited to bring the annexed Guidance to the attention of their Administration, industry, relevant shipping organizations, shipping companies and other stakeholders concerned.

***

ANNEX

GUIDANCE ON THE DEVELOPMENT OF A SHIP IMPLEMENTATION PLAN FOR THE CONSISTENT IMPLEMENTATION OF THE 0.50% SULPHUR LIMIT UNDER MARPOL ANNEX VI

Introduction

1 MEPC 70 agreed to "1 January 2020" as the effective date of implementation for ships to comply with global 0.50% m/m sulphur content of fuel oil requirement and adopted resolution MEPC.280(70) on the *Effective date of implementation of the fuel oil standard in regulation 14.1.3 of MARPOL Annex VI*[1].

2 In this context, MEPC 73 agreed that Administrations should encourage ships flying their flag to develop implementation plans, outlining how the ship may prepare in order to comply with the required sulphur content limit of 0.50% by 1 January 2020. The plan could be complemented with a record of actions taken by the ship in order to be compliant by the applicable date.

3 Regulation 18.2.3 of MARPOL Annex VI requires a Party to take into account all relevant circumstances and the evidence presented to determine the action to take, including not taking control measures. Administrations and port State control authorities may take into account the implementation plan when verifying compliance with the 0.50% sulphur limit requirement.

4 A ship implementation plan is not a mandatory requirement. A lack of a ship implementation plan or an incomplete ship implementation plan should not be considered as "clear grounds" for a more detailed inspection.

Ship implementation plan for the consistent implementation of 0.50% sulphur limit under MARPOL Annex VI

5 The ship implementation plan for 2020 could cover various items relevant for the specific ship, including, as appropriate, but not limited to:

.1 risk assessment and mitigation plan (impact of new fuels);

.2 fuel oil system modifications and tank cleaning (if needed);

.3 fuel oil capacity and segregation capability;

.4 procurement of compliant fuel;

.5 fuel oil changeover plan (conventional residual fuel oils to 0.50% sulphur compliant fuel oil); and

.6 documentation and reporting.

[1] Amendments to regulation 14.1.3 of MARPOL Annex VI were adopted by MEPC 73 (October 2018).

Issues relating to use of sulphur compliant fuel oil

6 All fuel oil supplied to a ship shall comply with regulation 18.3 of MARPOL Annex VI and chapter II/2 of SOLAS. Furthermore, ship operators could consider ordering fuel oil specified in accordance with the ISO 8217 marine fuel standard. The following potential fuel-related issues may need to be assessed and addressed by ships in preparation for and implementation of the 0.50% sulphur limit requirement:

.1 technical capability of ships to handle different types of fuel (e.g. suitability of fuel pumps to handle both higher and lower viscosity fuels, restrictions on fuels suitable for use in a ship's boilers, particularly the use of distillate fuels in large marine boilers);

.2 compatibility of different types of fuels e.g. when paraffinic and aromatic fuels containing asphaltenes are commingled in bunkering or fuel oil changeover;

.3 handling sulphur non-compliant fuels in the event of non-availability of sulphur compliant fuels; and

.4 crew preparedness including possible training with changeover procedures during fuel switching from residual fuel oil to 0.50% compliant fuel oils.

7 The ship implementation plan could be used as the appropriate tool to identify any specific safety risks related to sulphur compliant fuel oil, as may be relevant to the ship, and to develop an appropriate action plan for the Company to address and mitigate the concerns identified. Examples should include:

.1 procedures to segregate different types of fuel and fuels from different sources;

.2 detailed procedures for compatibility testing and segregating fuels from different sources until compatibility can be confirmed;

.3 procedures to changeover from one type of fuel to another or a fuel oil that is known to be incompatible with another fuel oil;

.4 plans to address any mechanical constraints with respect to handling specific fuels, including ensuring that minimum/maximum characteristics of fuel oil as identified in ISO 8217 can be safely handled on board the ship; and

.5 procedures to verify machinery performance on fuel oil with characteristics with which the ship does not have prior experience.

8 A ship implementation plan for the consistent implementation of the 0.50% sulphur limit under MARPOL Annex VI is recommended to be developed based on the indicative example as set out in appendix 1.

9 The plan could take into account the issues identified in:

.1 appendix 2: additional guidance on development of ship implementation plan (impact on machinery systems); and

.2 appendix 3: additional guidance on development of ship implementation plan (tank cleaning).

APPENDIX 1

INDICATIVE EXAMPLE FOR SHIP IMPLEMENTATION PLAN FOR ACHIEVING COMPLIANCE WITH THE 0.50% SULPHUR LIMIT ENTERING INTO FORCE ON 1 JANUARY 2020 USING COMPLIANT FUEL OIL ONLY

Particulars of ship

1. Name of ship:

2. Distinctive number or letters:

3. IMO Number:

Planning and preparation (before 1 January 2020)

1 Risk assessment and mitigation plan

1.1 Risk assessment (impact of new fuels): YES/NO
1.2 Linked to onboard SMS YES/NO

2 Fuel oil system modifications and tank cleaning (if needed)

2.1 Schedule for meeting with manufacturers and/or classification societies:

2.2 Structural Modifications (installation of fuel oil systems/tankage) required: YES/NO/NOT APPLICABLE

If YES, then:

2.2.1 Fuel oil storage system:

Description of modification:

Details of yard booking (as applicable), time schedules etc.:

Estimated date of completion of modification:

2.2.2 Fuel transfer, filtration and delivery systems:

Description of modification:

Details of yard booking (as applicable), time schedules etc.:

Estimated date of completion of modification:

2.2.3 Combustion equipment:

Description of modification:

Details of yard booking (as applicable), time schedules etc.:

Estimated date of completion of modification:

2.3 Tank cleaning required: YES/NO/NOT APPLICABLE

If YES, then:

Details of cleaning schedule (including, yard booking, time schedules etc., if applicable):

Estimated date of completion of cleaning:

3 Fuel oil capacity and segregation capability:

Following any required modifications as per Section 2:

3.1 Expected number of bunker tanks designated to store 0.50% sulphur compliant fuel oil:

3.2 Expected total storage capacity (m^3) for 0.50% sulphur compliant fuel oil:

3.3 Expected number of bunker tanks designated to store 0.10% sulphur compliant fuel oil:

3.4 Expected total storage capacity (m^3) for 0.10% sulphur compliant fuel oil:

3.5 Approximate total fuel oil content (m^3) in the fuel oil transfer, purification and delivery systems:

4 Procurement of compliant fuel oil

4.1 Details of fuel purchasing procedure to source compliant fuels, including procedures in cases where compliant fuel oil is not readily available:

4.2 Estimated date for bunkering compliant fuel oil, not later than 24:00hrs 31 December 2019:

4.3 If fuel arranged by charterer, is there an intention to accept charter party contracts that do not have a specified obligation to provide compliant fuel oil after 1 June 2019 or other date to be identified: YES/NO

If YES, then:

Details of alternate steps taken to ensure that the charter party provides timely delivery of compliant fuel:

4.4 Is there confirmation from bunker supplier(s) to provide compliant fuel oil on the specified date: YES/NO

If NO, then:
Details of alternate steps taken to ensure timely availability of compliant fuel oil:

4.5 Details of arrangements (if any planned) to dispose of any remaining non-compliant fuel oil:

5 Fuel oil changeover plan

5.1 Consider whether a ship-specific fuel changeover plan is to be made available. The plan should include measures to offload or consume any remaining non-compliant fuel oil. The plan should also demonstrate how the ship intends to ensure that all its combustion units will be using compliant fuel oil no later than 1 January 2020.

5.2 As per the ship-specific fuel changeover plan, the maximum time period required to changeover the ship's fuel oil system to use compliant fuel oil at all combustion units:

5.3 Expected date and approximate time of completion of the above-mentioned changeover procedure:

5.4 Consider availability of adequately trained officers and crew familiar with the ship's fuel system and fuel changeover procedures to carry out the fuel oil changeover procedure. If this cannot be confirmed, then consider whether there is a sufficient amount of time dedicated for ship-specific familiarization and training of new officers and crew.

6 Documentation and reporting

6.1 If there are modifications planned as per section 2, related documents including the shipboard fuel oil tank management plans and stability and trim booklets should be consequently updated.

6.2 The implementation plan could be kept on board and updated as applicable.

6.3 If when following the implementation plan the ship has to bunker and use non-compliant fuel oil due to unavailability of compliant fuel oil safe for use on board the ship, steps to limit the impact of using non-compliant fuel oil could be:

6.4 The ship should have a procedure for Fuel Oil Non-Availability Reporting (FONAR). The master and chief engineer should be conversant about when and how FONAR should be used and who it should be reported to.

APPENDIX 2

ADDITIONAL GUIDANCE FOR DEVELOPMENT OF THE SHIP IMPLEMENTATION PLAN (IMPACT ON MACHINERY SYSTEMS)

1 Ships are advised to assess potential impact on machinery systems with the use of distillates and fuel oil blends and prepare ships in consultation with chief engineers, equipment manufacturers and suppliers.

2 The ship tank configuration and fuel system may require adjustments. A fully segregated fuel system for distillate fuels and blended fuels is recommended because they may require special attention. Ship tank configuration and segregated fuel system will also allow for better management of potentially incompatible fuels.

Distillates

3 If distillates have been chosen as the option for compliance the following may be considered:

.1 a decrease in fuel oil viscosity may cause an increase in fuel oil leakage between the fuel pump plunger and barrel of diesel engines. Internal leakages in the fuel injection system may result in reduced fuel pressure to the engine, which may have consequences for the engine performance (e.g. starting of the engine). Equipment makers' recommendations should be consulted, and adequate testing, maintenance and possible installation of coolers etc. may be performed;

.2 shipowners may also consider installing fuel pumps and injection nozzles, suitable to fuel oil with low viscosity. Fuel oil with too low viscosity may lead to increased wear or seizure of fuel oil pumps. Engine and boilermakers should be consulted to ensure its safe and efficient operation. Implications for validity of NO_X certification (EIAPP Certificate) should be considered;

.3 while some compliant fuels may not require heating, others, including some distillates, will require heating. It would therefore be prudent to review heating arrangements for distillate fuels on board and, where appropriate, maintain the existing heating arrangements; and

.4 in some locations, bunker suppliers may only be able to offer automotive diesel fuel containing biodiesel (FAME) in accordance with the ISO 8217-2017 Standard which provides a marine biodiesel specification (DFA/DFB) with up to 7.0% by volume of FAME. CIMAC has provided a "Guideline for Ship Owners and Operators on Managing Distillate Fuels up to 7.0 % v/v Fame (Biodiesel)".[2]

4 In view of paragraph 3.3 manufacturers of engines and equipment such as oily water separators, overboard discharge monitors, filters and coalescers, etc. need to be consulted to confirm ability to handle biodiesel blends up to 7% v/v.

5 Also, some parts of the fuel oil supply system, i.e. fuel pumps, pipefittings and gaskets may need to be overhauled to ensure integrity.

[2] https://www.cimac.com/cms/upload/workinggroups/WG7/CIMAC_WG7_Guideline_for_Ship_Owners_and_Operators_on_Managing_Distillate_Fuels_May_2013.pdf

Blended residual fuels

6 New blended 0.50% sulphur fuel oil as and when offered could provide an alternative to conventional distillate fuel such as Marine Distillate Fuel.

7 When using such new blended sulphur fuel oils, the technical specification of such fuels are (a) either within the limits specified by ISO 8217 or are (b) issued with formal documentation indicating no objection to its use by the engine/boiler makers.

8 Before purchasing a new fuel oil product, operators should carefully consider the specific technical and operational challenges that this type of fuel oil may have and, where necessary, contact the fuel oil supplier or Original Equipment Manufacturer (OEM) for the considerations to be made to ensure safe operation.

9 Densities of these fuel oils are in general lower than conventional residual fuel oils. This may require adjustment of centrifuges to ensure adequate cleaning of the fuel oil.

Cold flow

10 Since most distillate fuels do not require heating (in fact, typically, heating is not recommended due to the low viscosity of these products), the fuel's cold flow properties become a potential handling/storage challenge, especially when operating in colder regions.

11 It is however possible to successfully manage cold flow properties through good fuel management, from procurement to technical operation, by considering the following:

.1 where the ship will be operating;

.2 where the risk is higher of getting fuels with poor cold flow properties;

.3 can the required cold flow properties be specified in the fuel contract;

.4 what is the actual low-temperature flow properties of the bunkered fuel; and

.5 which actions have to be taken in order to safely consume the bunkered fuel (e.g. tank and filter heating).

APPENDIX 3

ADDITIONAL GUIDANCE FOR DEVELOPMENT OF THE SHIP IMPLEMENTATION PLAN (TANK CLEANING)

Introduction

1 Most ships will have been using high viscosity high sulphur fuel oil (HSFO) based primarily on residual fuel oils. Such fuels tend to adhere to the inside of fuel tanks forming layers of semi-solid substances containing sediments and asphaltenic sludge; such residues will also typically have solidified and settled in various parts of the fuel oil service system including pipelines, settling and service tanks.

2 The ship operator may choose to clean the fuel oil tanks of these residues before loading compliant fuel prior to 1 January 2020 based on the following considerations.

3 Some of the fuels complying with the 0.50% sulphur limit are expected to be very paraffinic due to crude sources of blending components and also a high content of distillate components. If such fuels are loaded into HSFO fuel tanks that have not been cleaned, there is a possibility that they could dissolve and dislodge sediments and asphaltenic sludge in storage tanks, settling tanks and pipelines, potentially leading to purifier and filter operational issues and in extreme cases fuel starvation resulting in loss of power.

4 Alternatively, ships have been using ship specific changeover procedures to effectively and safely load on top of existing fuel oil and gradually flushing through the fuel system until the sulphur content in the fuel oil is at a compliant level.

5 Should the ship operator determine it is appropriate to clean the ship's fuel oil tanks and system, the following considerations may need to be taken into account when making arrangements for tank cleaning.

Options for tank cleaning, approximate timelines and considerations

6 Fuel oil tanks are normally cleaned on a regular basis on ships to remove built-up sediments and sludge, usually during dry docking and whenever inspections of the fuel tanks are due. However, leading up to 1 January 2020, it would not be practicable for the majority of the global fleet that has been running on HSFO and decided to opt for tank cleaning to undergo dry docking during a very short period. Hence, other options for cleaning tanks and fuel oil systems during service may need to be considered.

7 The time and work involved in cleaning HSFO tanks cannot be defined precisely, as it will vary depending on how long it has been since the last time the tanks were cleaned, the condition of the tank coating and the effectiveness of the cleaning process itself. The estimates in this document may err on the side of caution as it is almost impossible to pinpoint at what stage the ship's fuel oil system is sufficiently clean to guarantee compliance.

Manual cleaning during dry docking

8 Time required varies; it can be done in 2 to 4 days per tank. In addition to cleaning tanks, all of the pipework in the fuel oil service system needs to be flushed through. Overall, it may take 1 to 2 weeks.

9 A ship that has had all its fuel oil tanks and fuel system cleaned can start loading compliant fuels and expect to be fully compliant right away.

10 However, if only the tanks have been cleaned in dry dock, it could take 2 to 5 days to flush through the pipework in the fuel oil service system to ensure full compliance with the 0.50% sulphur limit.

Manual cleaning during service

11 If tanks are to be cleaned manually during service, risk assessment and safety measures are paramount; refer to IMO resolution A.1050(27) on *Revised recommendations for entering enclosed spaces aboard ships*.

12 Time required will vary depending on tank size and the number of tanks, how long it has been since the last tank cleaning and the number of crew available to perform safe and complete tank cleaning operations. Tank cleaning can be performed by the ship's crew and/or by employing a riding crew for this purpose. It is always good practice to inspect the tank once cleaned to check its condition and to inspect heating coils, conduct pressure tests and undertake repairs as necessary.

13 If the cleaning is done by the ship's existing crew, it would likely take a minimum of 4 days per tank. For an average tank, a week should be allowed. If employing a riding crew to clean the tanks, if working in shifts, it would likely take a minimum of 2 days to clean a tank, but 4 days per tank should be allowed.

14 Tanks need to be empty before they can be cleaned, hence the time needed to drain tanks needs to be taken into account when estimating the overall time required.

15 In addition to cleaning tanks, all of the pipework in the fuel oil service system needs to be flushed. Flushing the remaining pipework and fuel oil service system after all tanks have been cleaned could take another 1 to 2 days.

16 The residues from tank cleaning should be retained on board until they can be disposed of correctly or disposed to shore reception facilities.

Cleaning tanks in service with specialized additives

17 As an alternative to manual cleaning, consideration can be given to gradually cleaning the sediments and asphaltenic sludge from HSFO tanks and fuel systems by dosing additives. There are successful examples of this approach for ships that needed to reallocate HSFO tanks to fuels complying with the 0.10% sulphur limit that took effect in ECAs in 2015.

ANNEX 2

DRAFT GUIDELINES FOR CONSISTENT IMPLEMENTATION OF THE 0.50% SULPHUR LIMIT UNDER MARPOL ANNEX VI

[0 Introduction

0.1 Objective

0.1.1 MEPC 70 agreed to "1 January 2020" as the effective date of implementation for ships to comply with global 0.50% m/m sulphur content of fuel oil requirement and adopted resolution MEPC.280(70) on the *Effective date of implementation of the fuel oil standard in regulation 14.1.3 of MARPOL Annex VI*.

0.1.2 The purpose of these Guidelines is to ensure consistent implementation of the 0.50% sulphur limit under MARPOL Annex VI. These Guidelines are intended for use by Administrations, port State, shipowners, shipbuilders and fuel oil providers, as appropriate.

[0.2 Definitions

0.2.1 For the purpose of these Guidelines, the definitions in MARPOL Annex VI apply.

0.2.2 "HSFO" means high sulphur fuel oil where the sulphur content is above 0.50% m/m.]

1 Ship implementation planning for 2020

1.1 MEPC 70 agreed to "1 January 2020" as the effective date of implementation for ships to comply with global 0.50% m/m sulphur content of fuel oil requirement and adopted resolution MEPC.280(70) on the *Effective date of implementation of the fuel oil standard in regulation 14.1.3 of MARPOL Annex VI*[1].

1.2 In this context, MEPC 73 agreed that Administrations should encourage ships flying their flag to develop implementation plans, outlining how the ship may prepare in order to comply with the required sulphur content limit of 0.50% by 1 January 2020. The plan should be complemented with a record of actions taken by the ships in order to be compliant by the applicable date.

1.3 MEPC 73, recognizing the need for guidance to support the consistent implementation of the 0.50% sulphur limit under MARPOL Annex VI, approved MEPC.1/Circ.[…] on the *Guidance the development of a ship implementation plan for the consistent implementation of the 0.50% sulphur limit under MARPOL Annex VI*.

2 Impact on fuel and machinery systems

2.0.1 The experiences and lessons learned from the transition to the 0.10% m/m SO_X-ECA indicated that current ship machinery operations should be sufficiently capable of addressing the concerns regarding combustion of the new 0.50% m/m fuel oils.

[1] Amendment of regulation 14.1.3 of MARPOL Annex VI has been approved by MEPC 72 and is expected to be adopted at MEPC 73

2.0.2 Currently most of the marine diesel engines and boilers on ships operating outside Emission Control Areas (ECAs) are optimized to operate on heavy fuel oil. With the implementation of 0.50% sulphur limit in fuel oil from 2020, most of these ships, unless using exhaust gas cleaning systems (EGCS), will use compliant fuel oils.

2.1 **Distillate fuels**

2.1.1 A major challenge with distillate fuels is low viscosity. Low viscosity may cause internal leakages in diesel engines, boilers and pumps. Internal leakages in fuel injection system may result in reduced fuel pressure to the engine, which may have consequences for the engine performance (e.g. starting of the engine). Equipment makers recommendations should be consulted, and adequate testing, maintenance and possible installation of coolers, etc., may be performed.

2.1.2 Cold Filter Plugging Points (CFPP) and Cloud Points (CP) as well as the Pour Point for distillate fuels need to be considered in light of the ship's intended operating area and ambient temperatures.

2.1.2.1 These issues are critical concerns as they can result in the formation of sludge, which can cause costly and avoidable maintenance. In the worst-case scenario, sediment can cause engine fuel starvation and power loss.

2.1.2.2 ISO 8217 limits the cold flow properties of a fuel through setting a limit on the Pour Point (PP). However, given that wax crystals form at temperatures above the PP, fuels that meet the specification in terms of PP can still be challenging to operations in colder operating regions, as the wax particles can rapidly block filters, potentially plugging them completely.

2.1.2.3 Since the residual fuels are usually heated and distillate fuels are not heated, particular attention needs to be given to the cold flow properties of distillates.

2.1.2.4 Fuel temperature should be kept approximately 10°C above the Pour Point in order to avoid any risk of solidification however this may not reduce the risk of filter blocking in case of high CFPP and CP.

2.1.2.5 It is good practice to review the possibilities of heating arrangements for distillate fuels on board. This is usually very limited, as it is not standard practice to have heating arrangements in distillate storage, settling or service tanks. Transfer arrangements may be adapted to pass through a residual fuel oil heat exchanger should the need arise.

2.1.2.6 Knowing the fuel properties as soon as possible after bunkering will assist in taking the necessary precautions where and when necessary. If the ship is heading towards colder climates and the cold flow properties are inferior, the fuel may be:

.1 either used before entering cold regions, or

.2 used with suitable heating arrangement, as mentioned above.

2.1.2.7 If the approach of applying heat is being followed it should be ensured that the fuel is not overheated resulting in the viscosity dropping below the minimum recommendation of 2 cSt at any point in the fuel system, including the engine inlet. In order to reduce this risk, heating should be limited to max 40°C.

2.1.2.8 Reference may be made to CIMAC Guideline on Cold flow properties of marine fuel oils.

2.1.3 Distillate fuel with FAME content

2.1.3.1 Increased demand for Distillate fuels from the shipping sector from 2020 will likely have ramification across other industries and vice versa. We will see more land-based products making its way to marine supply pool with its attendant technical issues viz. Fatty Acid Methyl Easter (FAME) content.

2.1.3.2 ISO 8217: 2017 Standard includes FAME with 7% by volume maximum content for DFA/DFZ/DFB grades since some ports may offer automotive diesel fuel containing biodiesel (FAME) as the only fuel available. The maximum 7.0% (v/v) has been chosen as this aligns with the concentrations allowed in some of the countries applying environmental regulations.

2.1.3.3 There are various technical challenges associated with use of fuel having FAME content e.g. potential oxidation of biodiesel, its biodegradable nature etc. with adverse implications, limitations in storage life etc. It also needs to be tested for stability.

2.1.3.4 Manufacturers of engines and equipment like oily water separators, overboard discharge monitors, filters and coalscers etc. need to be consulted to confirm ability to handle biodiesel blends up to B7 (i.e. 7% v/v).

2.1.3.5 It is recommended to avoid using such biodiesel blend fuels for lifeboat engines, emergency generators/fire pumps etc. where it is stored in isolated individual unit fuel tanks and subjected to conditions for accelerated degradation.

2.1.3.6 Reference may be made to CIMAC Guideline for shipowners and operators on managing distillate fuels up to 7.0% v/v FAME (Biodiesel).

2.2 **Blended residual fuels**

2.2.1 Incompatibility

2.2.1.1 A wide range of blends of refined products will be used to make the new 0.5% sulphur fuels, and the stability and compatibility of the blends will be very important concerns for shipowners/operators. Unstable fuels can separate on their own and incompatible ones can do so when mixed in a single bunker tank, forming sludge that can block filters and ultimately cause engine failures.

2.2.1.2 Therefore, it will be extremely important to ensure that incompatible blended residual fuels are kept segregated and are tested for compatibility prior bunkering.

2.2.2 Catalytic fines

2.2.2.1 Cat fines are a by-product of refining and consist of small particles of metal that are deliberately introduced as catalysts to "crack" the fuel. Unless reduced by purification, cat fines will become embedded in engine parts and cause serious and rapid engine damage.

2.3 **Key technical considerations for shipowners and Operators**

2.3.1 Ship tank configuration and fuel system – the viscosity of most of these blended residual fuels is such that they cannot be used in distillate fuel-only systems and machinery, as they require heating for cleaning and combustion. A fully segregated fuel system for both distillate fuels and these new fuels is recommended.

(Note: Tank cleaning is recommended when using a residual fuel tank for storing these new fuels. This is to prevent sludge that has built up in these tanks from entering the fuel system.)

2.3.2 Heating requirements – due to the cold flow properties of most of these new fuels, permanent heating of the fuel may be necessary to minimize the risk of wax formation, also in storage. This is especially important in colder regions.

2.3.3 Fuel treatment system – Some of these new fuels may contain cat fines and/or sediments and therefore need onboard cleaning. Separator temperature and settings should be adjusted to the fuels' viscosity and density. Please refer to recommendations from OEM and fuel supplier.

(Note: Considering that many of these new fuels have lower viscosities compared to conventional residual fuels, care should be taken to ensure no overheating occurs.)

2.4 **ISO Standard for blended fuels**

2.4.1 The bunker market uses ISO 8217 specifications to ensure that the properties of the fuels it delivers conform to a standard that mean they comply with MARPOL Annex VI.

2.4.2 The existing ISO 8217 specification for marine fuels takes into consideration the diverse nature of marine fuels and incorporates a number of categories of distillate or residual fuels, even though not all categories may be available in every supply location it covers all marine petroleum fuel oils used today as well as the 0.50% Sulphur fuels of 2020. The General requirements as in ISO 8217:2017 specification for marine fuels and characteristics included in Table 1 and 2 of ISO 8217: 2017 mirror identified safety, performance and environmental concerns and further takes into consideration the onboard handling requirements, including storage, cleaning and combustion aspects of all fuel oils used today and the anticipated fuel blends of 2020, irrespective of the sulphur content of the fuel oils.

2.4.3 It is important that any new standards address and do not preclude the use of renewable and alternative non-fossil crude derived products, so long as they comply with the chemical properties specified for these fuel oils.

2.5 **Cylinder lubrication**

2.5.1 Choice of cylinder lubricating oils will often follow the fuel type in use. So, when changing to VLSFO operation from high-S fuel (HSFO) operation the choice of appropriate cylinder lubricating oil should be considered in accordance with the recommendations of the engine manufacturer.

3 Verification issues and control mechanism and actions

3.1 Survey and certification by Administrations

3.1.1 When undertaking a survey in accordance with regulation 5 of MARPOL Annex VI, the Administration should conduct a survey of a ship to verify that the ship complies with the provisions to implement the 0.50% sulphur limit. In particular, the Administration should check whether the ship carries compliant fuel oils for use, based on Bunker Delivery Note (BDN) onboard or any other document, as appropriate. If carriage of HSFOs for use is identified, the Administration should check whether regulation 3.2, regulation 4 or regulation 18.2.3 of MARPOL Annex VI are applied to the ship.

[3.1.1 The Administration confirms a ship's compliance with regulation 14 of MARPOL Annex VI during IAPP surveys, as described in HSSC Guidelines (A.1120(30)), and based on Bunker Delivery Notes and other relevant documents.]

[3.1.2 Where the Administration undertaking a survey finds a ship to be in non-compliance with regulations; in such case, the Administration should include reporting the information of the ship to the Global Integrated Shipping Information System (GISIS) MARPOL Annex VI module in accordance with paragraph 3.4 of these Guidelines, and may order debunkering of the HSFO either at the port of survey or the next port with an appropriate reception facility.]

3.1.3 According to regulation 11.4 of MARPOL Annex VI, the Administration shall investigate any report of an alleged violation and thereafter promptly inform the Party which made the report, as well as the Organization, of the action taken. When informing the Organization, the MARPOL Annex VI GISIS module should be used.

3.2 Control measures by port States

Port States should take appropriate measures to ensure compliance with the 0.50% of sulphur limit under MARPOL Annex VI, in line with the regulation 10 of MARPOL Annex VI and the *2009 Guidelines for port State control under the revised MARPOL Annex VI* (resolution MEPC.181(59)) (2009 PSC Guidelines). Specifically, the port State should conduct initial inspections based on documents and other possible materials, including remote sensing and portable devices. Given "clear grounds" to conduct a more detailed inspection, the port State may conduct sample analysis and other detailed inspections to verify compliance to the regulation, as appropriate.

3.2.1 Inspections based on documents and other possible targeting measurements

3.2.1.1 During the port State control and other enforcement activities, the port State should investigate whether a ship carries either compliant fuel oils or HSFOs for use, based on the documents listed in paragraph 2.1.1 of the 2009 PSC Guidelines. Results from remote sensing could be used to trigger inspections and portable devices could be used during the initial inspections, as appropriate. Remote sensing and portable devices are, however, of indicative nature and should not be regarded as the evidence of non-compliance.

3.2.1.2 If carriage of HSFOs for use was identified, the port State should further investigate whether regulation 3.2, regulation 4 or regulation 18.2.3 of MARPOL Annex VI are applied to the ship, based on the IAPP Certificate or a relevant document.

3.2.2 MARPOL samples and in-use fuel oil samples analysis

3.2.2.1 When the port State identifies clear grounds of non-compliance of a ship based on initial inspections, the port State may require samples of fuel oils to be analysed. The samples to be analysed may be either the representative samples provided with BDN in accordance with regulation 18.8.2 (MARPOL samples) or samples from designated sampling point in accordance with the *Guidelines for on-board sampling for the verification of the sulphur content of the fuel oil used on board ships* (MEPC.1/Circ.864) (in-use fuel oil samples).

3.2.2.2 In detecting non-compliance, the sample analysis, either on [MARPOL] [delivered] sample or [in-use] [onboard] fuel oil samples, should be conducted in a uniform and reliable manner in accordance with appendix VI of MARPOL Annex VI.

3.2.2.3 Notwithstanding the above process, all possible efforts should be made to avoid a ship being unduly detained or delayed. In particular, sample analysis of fuel oils should not unduly delay the operation, movement or departure of the ship.

3.2.2.4 If a non-compliance is established, the port State may not permit the ship to sail until the ship debunkers all HSFOs or takes any alternative measures. In addition, the port State should report the information of the non-compliant ship to the Administration of the ship and inform the Party or non-Party under whose jurisdiction a bunker delivery note was issued of cases of delivery of non- compliant fuel oil, giving all relevant information. Upon receiving the information, the Administration should report the information to the MARPOL Annex VI GISIS module in accordance with paragraph 3.4 of these Guidelines.

3.2.2.5 The Parties, however, may permit a single voyage for bunkering of compliant fuel oil for the ship, in accordance with regulation 18.2.4 of MARPOL Annex VI. The single voyage should be one way and minimum for bunkering, and the ship proceeds directly to the nearest bunkering facility appropriate to the ship. In the case that the port State permits a single voyage of a ship, the port State should inform the Administration of the information of the ship granted with permission for the single voyage with the certified record of analysis of the sample as the evidence.

3.2.3 Other enforcement practices dedicated to open-sea compliance monitoring:

.1 fuel oil changeover calculator;

.2 data collection system for fuel oil consumption of ships (resolution MEPC.278(70)); and

.3 continuous SO_X monitoring.

3.3 Control on fuel oil suppliers

3.3.1 In addition to control measures to ships, appropriate measures should also be taken to fuel oil suppliers, in accordance with regulation 18.9 of MARPOL Annex VI. In this context, the designated authorities should refer to paragraph 9 of appendix V of MARPOL Annex VI (BDN declaration). The designated authorities should also investigate the fuel oil supplier as appropriate, based on relevant information provided by port States, ships or any other relevant stakeholders.

3.3.2 If non-compliance, such as issuance of an incorrect BDN or a BDN without measurement of sulphur content, was found, the designated authorities should take appropriate corrective measures against the non-compliant supplier. In such case, the designated authorities should inform the Organization for transmission to the Member States of the non-compliant supplier, in accordance with the regulation 18.9.6 of MARPOL Annex VI and paragraph 3.4 of these Guidelines.

3.4 Information sharing related to non-compliances under MARPOL Annex VI

3.4.1 When a Party finds a non-compliance of a ship or a fuel oil supplier, the information of the non-compliance should be reported to the MARPOL Annex VI GISIS module (regulation 11.4).

3.4.2 Publication of information on non-compliant ships/companies or a reporting scheme to IMO to be registered on centralized information platforms are proposed as elements of an effective enforcement strategy. Various PSC regimes have successfully used the publishing of information related to substandard ships and companies as a deterrent to non-compliance.

Port States also need to report detentions of ships to IMO which may affect the future PSC targeting of the ship. The IMO GISIS database already makes available certain information related to non-compliances with the MARPOL Annex VI regulations.

4 Fuel oil non-availability

4.1 Guidance and information sharing on fuel oil non-availability

4.1.1 Regulation 18.2.1 of MARPOL Annex VI provides that in the event compliant fuel oil cannot be obtained, a Party to MARPOL Annex VI can request evidence outlining the attempts made to obtain the compliant fuel, including attempts made to local alternative sources. Regulations 18.2.4 and 18.2.5 then require that the ship notifies its Administration and the competent authority of the port of destination on the inability to obtain this fuel oil, with the Party to notify IMO of the non-availability.

4.1.2 Guidance on consistent evidence. Regulation 18.2.1.2 of MARPOL Annex VI requires that evidence be provided to support a claim that all efforts were made to obtain compliant fuel oil. In this regard, a Party may develop more detailed guidance for the consistent use and acceptance of these reports, including what evidence is needed to accompany a report to ensure that port States are applying the provisions under regulation 18.2.3, consistently.

4.1.3 Investigating non-availability. A Party may investigate the reports of non-availability. This process is important to ensure a consistent supply of compliant fuel to industry, as well as prevent incentives for ships to use ports where it is known that compliant fuel is not available on an ongoing basis. Critical to this process will be the sharing of information between Member States on reported compliant fuel oil supply issues.

4.1.4 In accordance with regulation 18.2.5 of MARPOL Annex VI, a Party to MARPOL Annex VI shall notify the Organization when a ship has presented evidence of the non-availability of compliant fuel oil. For this purpose, MARPOL Annex VI GISIS module provides the platform for Parties to upload such notifications.

[4.1.5 It is expected that each Party shall take all reasonable steps to promote the availability of above compliant fuel oil and inform the Organization through MARPOL Annex VI GISIS module of the availability of compliant fuel oils in its ports and terminals.]

4.1.6 Should a vessel, despite its best effort to obtain compliant fuel oil, be unable to do so, the master/Company must:

.1 present a record of actions taken to attempt to bunker correct fuel oil and provide evidence of an attempt to purchase compliant fuel oil in accordance with its voyage plan and, if it was not made available where planned, that attempts were made to locate alternative sources for such fuel oil and that despite best efforts to obtain compliant fuel oil, no such fuel oil was made available for purchase; and

.2 best efforts to procure compliant fuel oil include, but are not limited to, investigating alternate sources of fuel oil prior to commencing the voyage. If, despite best efforts, it was not possible to procure compliant fuel oil, the master/owner must immediately notify the port State Administration in the port of arrival and the flag Administration (regulation 18.2.4 of MARPOL Annex VI).

4.1.7 In order to minimize disruption to commerce and avoid delays, the master/Company should submit fuel oil non-availability report (FONAR) as soon as it is determined or becomes aware that it will not be able to procure and use compliant fuel oil.

4.1.8 Port State control authority may contact the submitter (and/or shipowner or operator) in the event of an incomplete submission, and request for additional information, or to pursue an enforcement action such as a Notice of Violation.

4.2 Standard format for reporting fuel oil non-availability

4.2.1 For ships which are unable to purchase fuel oil meeting the requirements of regulations 14.1 or 14.4 of MARPOL Annex VI, the standard format for reporting fuel oil non-availability is set out in the appendix to this document, in accordance with regulation 18.2.4 of MARPOL Annex VI.

5 Safety implications relating to the option of blending fuels in order to meet the 0.50% m/m sulphur limit

5.1 [No concrete text has been provided.]

6 Other useful guidance/information that assist Member States and stakeholders

6.1 Guidance addressing quality assurance and integrity of the supply chain

6.1.1 The diverse range of 0.50% m/m fuel formulations expected will further elevate the importance of assuring sulphur compliance of the supplied fuel oils. It is expected that these fuel oils to be blended close to or on the 0.50% m/m limit, driven by the economic considerations of blending. Ship operators should request additional assurances that fuels supplied are consistently compliant.

6.1.2 In view of this, there will be a greater expectation on suppliers having in place a robust and transparent supply chain assurance system, which adequately addresses all those factors that could affect the quality and sulphur content of the delivered fuel. This would, for example, be expected to include procedures such as ensuring: avoidance of the ingress of extraneous and potentially deleterious compounds into the supply chain, correct blending procedures being applied, the delivery meeting the ship ordering requirements and representative sampling of the bunkers supplied are taken (resolution MEPC.182(59)).

6.2 Guidance on the importance of fuel oil management on board

[A very large number of different fuels will be available at the market, e.g. 0.5% sulphur distillate (VLSFO-DM), 0.1% sulphur distillate (ULSFO-DM), 0.5% sulphur blended residue (VLSFO RM), 0.1% sulphur blended residue (ULSFO-RM), DMA grade distillate with no biodiesel (DMA-0% FAME), DMA grade distillate with up to 7% biodiesel (DMA-7% FAME), DMZ/DMB grade distillate with no biodiesel (DMZ/DMB-0% FAME), DMZ/DMB grade distillate with up to 7% biodiesel (DMB/DMC -7% FAME), High sulphur fuel (HSFO), LNG and others. This is a significant change compared to today's market and not all fuel types can be mixed without consequences for the operation. Stability, compatibility, pour point, viscosity, and wax are issues that need to be managed and there will be a need for robust procedures for household, to avoid mixing and contamination on board the vessels as well as in the supply chain prior to delivery.

6.2.1 Distillate fuels

6.2.1.1 Cold flow

6.2.1.1.1 Since distillate fuels do not require heating (in fact, typically, heating is not recommended due to the low viscosity of these products), the fuel's cold flow properties become a potential handling/storage challenge, especially when operating in colder regions.

6.2.1.1.2 It is however possible to successfully manage cold flow properties through good fuel management, from procurement to technical operation by considering the following:

.1 where the ship will be operating;

.2 where the risk is higher of getting fuels with poor cold flow properties;

.3 can the required cold flow properties be specified in the fuel contract;

.4 what is the actual low-temperature flow properties of the bunkered fuel; and

.5 which actions have to be taken in order to safely consume the bunkered fuel (e.g. tank and filter heating).

6.2.1.2 Limited shelf life

6.2.1.2.1 Low sulphur diesels tend to be more stable than high sulphur fuels as hydro treating typically destroys the precursors to insoluble organic particulates. However, along with lubricating compounds, hydro treating also eliminates naturally occurring antioxidants. It is why refineries treat distillate fuels with stabilizers to prevent deterioration and the formation of peroxides, the forerunners to soluble gums. Unfortunately, such stabilizers actually have a limited shelf life and once the storage period of the fuel exceeds the shelf life it is unprotected from deterioration.

6.2.1.2.2 Experiencing a change in colour along with gum and sediment formation, a distillate fuel that is undergoing degradation through reactions with oxygen will, if unchecked, tend to go on to form deposits, especially on the fuel injectors. The reason the deposits end up on the fuel injectors is that when a degrading fuel leaves the injector to be atomized it tends to coke on the nozzle. The coking starts to build and the spray pattern from the injection nozzle is affected reducing fuel economy and engine durability and actually increasing emissions.

6.2.1.2.3 Consideration may be given to use of additives to address deterioration of distillate fuels.

6.2.2 Blended residual fuels

6.2.2.1 Incompatibility

6.2.2.1.1 Onboard testing can provide engineers with an incompatibility warning when mixing or commingling new and existing fuels.

6.2.2.1.2 The simple-to-use spot test uses a blend composed of representative volumes of the sample fuels. A drop of the blend is placed on a test paper and heated to 100°C. After one hour, the resultant spot is examined for the presence of solids and rated for compatibility against a reference chart.

6.2.2.1.3 In addition to the compatibility spot test it is also possible for the crew to perform simple checks to assess a fuel's viscosity, water content, density and the presence of catalytic fines.

6.2.2.1.4 Main bunker tanks should be arranged to limit the need to mix newly bunkered fuel with fuel already on board. When mixing of fuel oil is necessary, a compatibility test should be performed prior to transfer.

6.2.2.2 Cat fines

6.2.2.2.1 As per most diesel engine makers the maximum amount of catalytic fines reaching the engine should be 10 ppm Al+Si and in some instances, this might rise to 15 ppm however, every attempt must be made to reduce the cat fines to the lowest possible levels.

6.2.2.2.2 Particle size has a significant influence on the capacity of the centrifugal separators to lower the level of catalyst fines in the fuel, with particles of 2 microns or less being particularly difficult to remove. The presence of particles of 2 microns size or lower may cause difficulties in achieving the 10 ppm limit. Engine manufacturer recommendations should also be referred to for any further system-specific recommendations.

6.2.2.2.3 Contributory changes that would help:

.1 sampling and testing of fuel before use;

.2 improved fuel handling on board;

.3 regular cleaning of filters, frequent drainage;

.4 clean the settling and service tanks during dry dock;

.5 check centrifuge capacity on specifications for new buildings;

.6 ensuring optimized fuel system treatment;

.7 introducing a new fuel cleaning system layout;

.8 automatic control of the cleaning flow rate; and

.9 intensified monitoring of the fuel treatment efficiency.

6.2.2.2.4 A lab can also carry out highly detailed analysis for issues such as cat fines and stability, which can provide additional peace of mind.

6.2.3 Audits

It is recommended that once a new bunker has started to be used, a responsible person on board performs a fuel system audit, taking fuel samples from before and after the treatment plant and at the engine fuel rail.

6.2.4 IACS Recommendations

6.2.4.1 IACS Recommendation No.151 – Recommendation for petroleum fuel treatment systems for marine diesel engines.

6.2.4.2 IACS recommendation No.151 recognizes a disparity between the quality of fuel bunkered and delivered in accordance with ISO 8217 (latest revision), and the fuel quality requirements typically specified by marine diesel engine manufacturers. The performance of the system and equipment contained therein is fundamental to reducing the level of contaminants to within the oil fuelled machinery manufacturers specifications. Consideration may be given to use this document to ensure efficient functioning of fuel treatment system.]

6.3 Guidance on assuring availability of compliant fuel oil, including new fuel blends

[6.3.1 It is acknowledged that making available 0.50% m/m compliant fuels may provide a logistical challenge in some regions, areas and or ports during the initial implementation stage partly due to the timely availability of new fuel blends. It is therefore recommended that industry preparation for 2020 should be duly planned and started well ahead of the implementation date by all stakeholders. All relevant parties from refinery through to the user should play an active role to assist ships to be ready for the 1 January 2020 implementation date. To minimize occurrences of localized fuel unavailability and to address the possibility of any declarations of fuel unavailability; harmonization and standardization of processes deemed necessary by the Committee should be developed.

6.3.2 In order to facilitate the process of declaring non-availability and its expected acceptance a more detailed guide to declaring "Non-Availability" and associated questions and answers could further harmonize enforcement efforts, notwithstanding the discretion of the inspecting authority. In this context, consideration could be given to existing "best practice" for example by reviewing the current United States Environmental Protection Agency Fuel Oil Non-Availability Report[2] (FONAR) as a basis.]

6.4 Guidance addressing fuel quality issues, particularly regarding new types of fuels and blends

6.4.1 [No concrete text has been provided.]

6.5 Guidance on best practice for fuel oil purchasers/users for assuring the quality of fuel oil used on board ships

6.5.1 MEPC 72 approved MEPC.1/Circ.875 on *Guidance on best practice for fuel oil purchasers/users for assuring the quality of fuel oil used on board ships*. These best practices are intended to assist fuel oil purchasers/users in assuring the quality of fuel oil delivered to, and used on board ships, with respect to both compliance with the MARPOL requirements and the safe and efficient operation of the ship.

6.5.2 These fuel oil purchaser/user best practices are recommended for all ships and should also be taken into account in those cases where fuel oil purchasing decisions are made by the ship charterer pursuant to a chartering agreement. Under such a charter agreement communication between the owner and the charterer is paramount. It is recommended that clear requirements on these communications should be included within the appropriate charter party clause.

[2] https://www.epa.gov/sites/production/files/documents/fondinstructions.pdf

6.6 Guidance on best practice for Member State/coastal State

6.6.1 [MEPC 71 re-established the Correspondence Group on Fuel oil quality and instructed it to finalize the draft best practice for Member State/coastal State and submit a report to MEPC 73.]

6.7 Guidance on best practice for fuel oil suppliers

6.7.1 [MEPC 72 concurred with the view that draft best practice for fuel oil suppliers as contained in document MEPC 72/INF.13 could form a basis for the development of IMO guidance and invited Member Governments and international organizations to submit comments on document MEPC 72/INF.13 to MEPC 73.]]

APPENDIX

FUEL OIL NON-AVAILABILITY REPORT (FONAR Report)

[Note:

1 This report is to be sent to the flag Administration and to the competent authorities in the relevant port(s) of destination in accordance with regulation 18.2.4 of MARPOL Annex VI. The report shall be sent as soon as it is determined that the ship/operator will be unable to procure compliant fuel and preferably before the ship leaves the port/terminal where compliant fuel cannot be obtained. A copy of the FONAR should be kept on board for inspection for at least [12] months.

2 This report should be used to provide evidence if a ship is unable to obtain fuel oil compliant with the provisions stipulated in regulations 14.1 and 14.4.

3 Before filing a FONAR Report, the following should be observed by the ship/operator:

3.1 A fuel oil non-availability report is not an exemption. According to regulation 18.2 of MARPOL Annex VI, it is the responsibility of the Party through its competent authority to scrutinize the information provided, including on potential claims already filed during a period of [12] months, and decide what action to take.

3.2 In case of unduly and/or repeated claims of non-availability, the Party may require additional documentation and substantiation of fuel oil non-availability claims. The ship/operator may also be subject to more extensive inspections or examinations while in port.

3.3 Ships/operators are expected to account for logistical conditions and/or terminal/port policies when planning bunker delivery, including but not limited to having to change berth or anchor within a port or terminal in order to obtain compliant fuel.

3.4 Ships/operators are expected to prepare as far as reasonably possible to be able to operate on commercial available fuel oils meeting ISO 8217, included but not limited to fuels with differing viscosities, different sulphur content shall not exceed 0.50% (requiring different lube oils) as well as fuel requiring heating and/or other treatment on board.

1 Particulars of ship

1.1 Name of ship: _____
1.2 IMO number: _____
1.3 Flag: _____

2 Description of ship's voyage plan and information on entering an ECA

2.1 Description of ship's voyage plan

2.1.1 Provide a description of the ship's voyage plan in place at the time of entry into the port where compliant fuel oil was not available (attach copy of plan if available):

_____
_____
_____

2.2 Information on entering an Emission Control Area (ECA) (as applicable)

2.3.1 If ship is to enter an Emissions Control Area (ECA) provide information as requested in items 1 to 6:

1 – Date ship first received notice that it would be transiting in the ECA:

_____

2 – Ship's location at the time of notice:

_____

3 – Date/time ship operator expects to enter ECA:

_____

4 – Date/time ship operator expects to exit ECA:

_____

5 – Projected days ship's main propulsion engines will be in operation within ECA:

_____

6 – Sulphur content of fuel oil in use when entering and operating in the ECA (BDN):

_____

3 Evidence of attempts to purchase compliant fuel oil

3.1 Description of all actions taken to attempt to achieve compliance, including attempts to locate alternative sources for compliant fuel oil

_____
_____
_____

3.2 Description of the reason why, despite best efforts, compliant fuel oil was not obtained:

_____
_____
_____
_____

3.3 Name and addresses of suppliers contacted, date of contact

_____
_____
_____
_____

Please attach copies of communication with suppliers (e.g. e-mails to and from suppliers)

4 Plans to obtain compliant fuel oil

Describe availability of compliant fuel oil at the next port of call/bunker facility, and plans to obtain it:

_____

If compliant fuel oil is not available at the port of call, list the lowest sulphur content of available fuel oil(s) or the lowest sulphur content of available fuel oil at the next port of call:

5 Special circumstances

5.1 Disruption in the supply of fuel oil

In case of disruption in the fuel oil supply, this should be documented by copy of communication with the competent authorities of the State in question.

Name of port at which vessel was scheduled to receive compliant fuel oil: _____

Name of the fuel oil supplier that was scheduled to deliver: _____

Contact details of the competent authority of the State in question: _____

5.2 Operation constraints

If non-compliant fuel has been bunkered due to concerns that the quality of the compliant fuel available would cause operational or safety problems on board the ships, the concerns should be thoroughly documented, preferably by a third party.

Please describe, the steps the ship has taken, or is taking, to resolve these operational constraints, if applicable, that will allow ship to use commercially available fuel oils: _____

6 Company information

Name of Company *(as named on ISM DOC)*: _____
Address (street, city, country, postal/zip code): _____
ISM Designated Person Ashore (DPA): _____
Telephone number/email: _____
Local agent(s) in the port of call(s): _____

Print name: _____ Date *(DD/MM/YYYY)*: _____

Signature of Master: _____]

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INTERNATIONAL MARITIME ORGANIZATION

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4 ALBERT EMBANKMENT
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MEPC.1/Circ.875/Add.1
9 November 2018

GUIDANCE ON BEST PRACTICE FOR FUEL OIL SUPPLIERS FOR ASSURING THE QUALITY OF FUEL OIL DELIVERED TO SHIPS

1 The Marine Environment Protection Committee, at its seventy-third session (22 to 26 October 2018), approved the *Guidance on best practice for fuel oil suppliers for assuring the quality of fuel oil delivered to ships*, as set out in the annex.

2 Member Governments are invited to bring the annexed Guidance to the attention of their Administration, industry, relevant shipping organizations, shipping companies and other stakeholders concerned, as appropriate.

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ANNEX

GUIDANCE ON BEST PRACTICE FOR FUEL OIL SUPPLIERS FOR ASSURING THE QUALITY OF FUEL OIL DELIVERED TO SHIPS

1 INTRODUCTION

1.1 MARPOL Annex VI contains requirements that apply to fuel oil used on board ships. Regulation 14 sets limits on the sulphur content of fuel oil used on board ships, both within designated SO_X emission control areas (regulation 14.4) and globally (regulation 14.1). Regulation 18.3 contains requirements that fuel oil delivered to and used on board ships should not jeopardize the safety of ships or adversely affect the performance of machinery. Regulation 4.2.1.1 of SOLAS II-2 stipulates that except as otherwise permitted, no fuel oil with a flashpoint of less than 60°C shall be used.

1.2 Fuel oil purchasers are responsible for correctly specifying the fuel oil which is to be supplied. It is the responsibility of the supplier to deliver fuel oil which is compliant with the agreed specification and statutory limits.

1.3 These best practices are intended to assist fuel oil suppliers to ensure the quality of fuel oils delivered to ships which is compliant with the agreed specification and statutory limits.

1.4 When developing their procedures, fuel oil suppliers should also consider the guidance provided by existing industry practices and standards, for example those published by the International Organization for Standardization (ISO).

1.5 This guidance does not apply to supply of low flashpoint fuels such as LNG, LPG or methyl/ethyl alcohols, nor to pure biofuels.

2 DEFINITIONS

2.1 *SOLAS*: International Convention for the Safety of Life at Sea, 1974, as amended.

2.2 *MARPOL*: International Convention for the Prevention of Pollution from Ships, 1973, as amended.

2.3 *Bunker(s)*: Hydrocarbon based fuel for ship consumption. Primarily derived from petroleum sources, may also contain hydrocarbons from synthetic or renewable sources. Bunkers are chiefly classified as distillate or residual fuel oils usually referred to as "fuel oils" in IMO documents.

2.4 *Bunker supplier/Supplier*: Manufactures or buys, owns, stores and sells bunkers. Distributes bunkers from pipelines, trucks and/or barges. May blend products to meet the customer's specifications. May own or charter a distribution network or may hire delivery services from a third party. Issues the bunker delivery note (BDN).

2.5 *Bunker barge provider*: Owner/operator of tankers or barges providing transportation services for a physical supplier. Usually issues the BDN on behalf of the supplier.

2.6 *Truck provider*: Owner/operator of tank trucks. Usually issues BDN on behalf of the supplier.

2.7 *Cargo officer/Supplier's representative*: Person appointed by the bunker supplier to be responsible for the delivery of bunkers to the ship and is responsible for the completion of the documentation to be provided to the receiving ship.

2.8 *Bunker buyer/Purchaser*: Secures and pays for bunkers delivered to a ship at the operator side (user) and not a trader. Can be a shipowner's operator or a charterer's operator; and often used in contracts as counterpart of the supplier.

2.9 *Quality-oriented fuel oil supplier:* A fuel supplier with a quality management system certified in accordance with an internationally recognized standard (ISO 9001 or equivalent), and which may be registered with the Member State and/or licensed, where such licensing/accreditation schemes are in place; and therefore can be expected to be on time, meet the statutory requirements, supply the quantity and quality stated on the BDN, provide support and be able to address relevant issues.

3 GOALS/OBJECTIVES

3.1 The best practices set forth in this document reflect a set of goals intended to assure the quality of fuel oil delivered to ships, as follows:

.1 bunkers delivered at the point of custody, which can be the receiving ship's rail or manifold, to meet the buyer's ordered specifications;

.2 bunkers delivered to be in compliance with sulphur limits specified by the buyer in accordance with regulation 14 of MARPOL Annex VI;

.3 bunkers delivered to be in compliance with regulation 18.3 of MARPOL Annex VI which contains requirements that fuel oil delivered to and used on board ships shall not include any added substance or chemical waste that jeopardizes the safety of ships, adversely affect the performance of the machinery, is harmful to personnel or contributes to additional air pollution;

.4 bunkers delivered to meet SOLAS Chapter II-2 requirements regarding flashpoint;

.5 Safety Data Sheets (SDS, formerly known as MSDS – Material Safety Data Sheets) and other relevant documentation detailing the fuel properties to be provided to the buyer;

.6 bunkers to be delivered to the ship in a safe and efficient manner, preventing practices that may compromise safety and crew health or the quality as delivered to the receiving ship;

.7 representative samples to be taken during delivery in accordance with regulation 18.8.1 of MARPOL Annex VI, taking into account the *2009 Guidelines for the sampling of fuel oil for determination of compliance with the revised MARPOL Annex VI* (resolution MEPC.182(59));

.8 seek transparency/traceability and ensure quality control throughout the bunker supply chain;

.9 mitigating quality risks throughout the supply chain to avoid disputes;

.10 encourage interactions and clear lines of communication regarding procedures to be followed between bunker suppliers and bunker buyers from the point of order up to the point of delivery; and

.11 encourage effective dispute resolution through collaboration and communication between parties.

BEST PRACTICES

4 General

4.1 In order to ensure that the quality of bunkers delivered to ships meets the relevant specifications, suppliers should source from appropriate refinery streams and/or hydrocarbon streams from synthetic or renewable sources to produce bunkers meeting the relevant specifications. The end product should be homogeneous and stable.

4.2 To ensure that the product conforms to relevant specifications and statutory limits, the final blend should always be tested against the relevant standards and the test results should be documented.

4.3 In order to maintain quality control throughout the supply chain, it is important to have documentation to help identify product origins back to the manufacturing source and the various links in the chain to enable traceability, especially if problems arise to help pinpoint the source of the problem and take remedial action.

4.4 Once a bunker blend has been produced and tested, appropriate storage and cargo handling in shore tanks and onboard cargo and bunker supply tankers should be adopted to maintain product integrity.

4.5 The supplier is responsible for providing the required representative samples of the product delivered to ships to be taken at the ship's manifold and the required documentation including the bunker delivery note (BDN) and safety data sheets (SDS).

4.6 In addition to these guidelines, fuel oil suppliers should also refer to ISO 13739 Petroleum products – Procedures for transfer of bunkers to ships, relevant national standards such as SS 524: 2014 – Singapore Specification for quality management for bunker supply chain (QMBS), SS 600 – Singapore Standard Code of Practice for Bunkering, and to industry best practices such as guidelines published by CIMAC.

5 Quality control during production of bunkers

5.1 Blending should, in principle, only take place in shore tanks in order to ensure the end product is homogeneous. The quality of the resultant blends should be tested and confirmed prior to delivery to ship.

5.2 The bunker supplier should ensure control of individual blend component quality. This includes knowing their individual properties through accurate data, and the component origins, supported by relevant documentation.

5.3 Blend components should be tried and tested so that their typical properties and suitability for bunker fuel production, and how they combine with other components, is well understood, with particular attention being given to the compatibility between blend components. Blending operatives should have appropriate knowledge of blending bunkers.

5.4 Where there are any uncertainties as to the nature and quality of a blend component, any issue should be identified and resolved before its use in the production of bunkers.

5.5 The following are recommended for bunker suppliers to ensure the quality of blends:

.1 maintain a database of suitable and unsuitable blend components based on experience, industry knowledge and reported incidents;

.2 development and/or use of appropriate blend modelling tools; and

.3 test new/unfamiliar blends rigorously to meet the requirements of regulation 18.3 of MARPOL Annex VI and recognized standards, such as ISO 8217 Petroleum products -- Fuels (class F) -- Specifications of marine fuels.

5.6 The blend should not contain extraneous, potentially deleterious, materials as defined in clause 5 in ISO 8217 and regulation 18.3 of MARPOL Annex VI. This does not preclude the use of additives intended to improve specific fuel characteristics such as cold flow properties or combustion properties.

5.7 Any additives used should be known and have a proven track record in marine fuel application. Any new additive should be thoroughly evaluated to ensure it is fit for use in marine fuel application (for example, be accepted by engine manufacturers).

5.8 Key data of the blend components include, but are not limited to, viscosity, density, flashpoint and sulphur. Sufficient data should be available on blending components to ensure the final blend fully meets the requirements of the grade of bunkers being made.

5.9 Blend proportions as determined from component data need to be correctly calculated and set and thereafter maintained during production of the specified product.

5.10 To ensure the end product is stable, the producer should ensure that all blend components are mutually compatible to avoid precipitation of solids. This can be done through testing compatibility of the blend components.

5.11 The final blend should be tested at a qualified laboratory. The sample sent for testing should be taken in accordance with guidelines for obtaining a representative sample (bottom, middle and top of the tank).

5.12 Blending during delivery should be avoided.

5.13 If it is anticipated that the product will be close to a limit maximum/minimum, the producer should keep in mind the precision of individual test methods when setting blend targets to ensure the product meets the specification limit with sufficient confidence. In the case of fuel oil sulphur content, producers are recommended to follow the guidelines provided in ISO 4259 Petroleum products -- Determination and application of precision data in relation to methods of test.

6 Quality control in the supply chain

6.1 Fuel quality can be compromised at several points in the supply chain, up to and including delivery to ship. It is therefore recommended that the supplier establishes, documents and maintains a quality management system (QMS) covering all stages from taking custody of the product until the product passes the point of custody transfer to the receiving ship.

6.2 If part of the supplier's supply chain is performed by other parties, such as terminal operators and bunker barge or truck providers, these should be identified in the QMS and the supplier should strive to ensure control and maintain oversight over the supply chain.

7 Bunker transport, storage and transfer

7.1 The quality of a bunker fuel or blend components may change compared to its origin during transport, storage and transfer. The supplier should seek to prevent the quality known from the original test report and/or certificate of quality (COQ) from being compromised through working closely with third parties as follows:

.1 tankers intending to transport the fuels as cargo should demonstrate to the supplier that the tanker is certified to carry this type of cargo (e.g. clean/dirty petroleum products). Suppliers should seek information about previous cargoes in case remaining residues could contaminate the product. Suppliers should also seek guarantees that the cargo tank has been properly cleaned if the previous cargo presents a risk of cross-contamination;

.2 ensure that storage tanks at refineries or at independent storage facilities are suitable for the type of cargo to be stored, and that storage tanks are in good condition (e.g. no rust) before a new cargo is loaded. If tanks are not empty before loading new cargoes, ensure the resulting blend is properly mixed so that it is homogeneous and stable and that the new blend is properly tested using samples from the bottom, middle and top of the tank;

.3 ensure good housekeeping during storage. This includes keeping products at the right temperature and preventing water ingress into the tank. Any water that accumulates should be removed to avoid conditions leading to microbial/bacterial growth that can severely compromise the bunker quality;

.4 if part of the supplier's supply chain is performed by other parties, such as terminal operators and operators of supply ships or trucks, these should be identified in the QMS and the supplier should strive to ensure control and/or maintain oversight over the supply chain;

.5 pipelines at terminals may be used to transfer several types of cargo (known as multiproduct pipelines). If this is the case, seek verification that pipelines have been adequately cleared to prevent cross-contamination that may affect the overall quality or compromise the product specification;

.6 prior to loading, barge providers should seek verification from the loading terminal that the product transfer pipelines have been properly cleared to prevent cross-contamination with the previous products transferred via the pipeline;

.7 bunker tankers/barges should avoid loading cargo from different shore tanks into the same cargo tank, unless the shore tanks contain products of the same grade and with the same certificate of quality;

.8 a representative sample should be taken during the loading of the bunker tanker/barge. The sampling should be witnessed and countersigned by a representative from the bunker tanker/barge and a representative of the loading terminal. The sample should be taken in accordance with recognized standards, such as ISO 3170/ASTM D4057 (manual sampling standard) or ISO 3171 (pipeline auto-sampling);

.9 ensure good housekeeping during product storage and handling on the barge. This includes keeping fuels at the right temperature and preventing water ingress into the tank from external sources or condensation;

.10 suction line strainers on cargo pumps should be cleaned periodically, and always cleaned before changing to a different grade of cargo; and

.11 when loading the bunker supply tanker/barge (or truck), the following precautions are recommended:

.1 avoid loading different product batches into the same cargo tank;

.2 ensure the cargo tank is empty before loading a new cargo into it; and

.3 seek information about previous cargoes in case residues from a previous cargo could contaminate the product. Seek guarantees that the cargo tank has been properly cleaned if the previous cargo presents a risk of cross-contamination.

8 Delivery to ship (bunkering operations)

8.1 Delivery to ship can be directly from a shore tank (at refinery or terminal) via pipeline, from a bunker tanker/barge coming alongside the ship at berth, at anchorage or off-shore, or from a road truck or rail car at berth.

8.2 Detailed guidance for bunkering procedures, including a sample bunkering checklist, may be found in various available guidance documents, for example chapter 25 of the International Safety Guide for Oil Tankers and Terminals (ISGOTT).

8.3 Clear communications should be established between supplier (bunker barge, truck or terminal) and the receiving ship and emergency stop and response actions agreed prior to any bunkering activities commencing.

8.4 In order to address the health and safety risk to crew on both the supply ship and receiving ship, all parties involved in the bunkering operation should wear adequate personal protective equipment (PPE) and take due care to prevent skin contact with bunkers and exposure to hazardous fumes.

8.5 If more than one grade of bunkers is to be supplied, the order in which the grades are to be supplied should be agreed between the cargo officer and the receiving ship's chief engineer. To avoid contamination of product during delivery, it is recommended that the lighter/lowest sulphur grade is supplied first followed by the heavier/higher sulphur grade.

8.6 Ensure that all supply pipelines and hoses are thoroughly cleared of residue prior to every new delivery, especially if the supply pipeline/hose is going to be used to supply a different product specification than the previous delivery.

8.7 Carry out line clearing of bunker hose(s)/pipelines at the end of the pumping operation. Once line clearing is completed, the contents in the hose should be drained back into the bunker tanker's cargo tank.

8.8 There should be segregated pipelines/hoses and bunker connections for supply of materially different types of product, e.g. for residual and distillate grades, and for high and low sulphur bunkers to prevent cross-contamination of products.

8.9 Collection of a representative sample should be performed for each separate grade being delivered. If more than one tanker/barge or truck is used to supply the ship, a separate set of representative sample(s) should be taken and a separate BDN issued for each tanker/barge or truck.

9 Representative sampling

9.1 Sampling is an integral part of quality control and vital in protecting the interest of all parties involved. Samples may be used as evidence both for commercial, regulatory or even criminal disputes and in court cases. The objective is to obtain samples that are truly representative of the product being transferred, both during delivery to ship and upstream in the supply chain as appropriate prior to the bunker delivery.

9.2 To ensure samples are representative, a single primary sample for each grade of fuel delivered from each tanker/barge or truck should be drawn continuously throughout the entire product transfer by either an automatic sampler or manual continuous drip sampler.

9.3 While a fuel oil supplier may use ISO 13739 and ISO 3171 for automatic pipeline sampling, ISO 3170 for manual methods or some other protocol for obtaining samples, it should be remembered that MARPOL Annex VI sets out the procedures for compliance and enforcement which includes resolution MEPC.182(59) on the *2009* G*uidelines for the sampling of fuel oil for determination of compliance with the revised MARPOL Annex VI.*

9.4 The sample taken during delivery or from a tank should be collected in a clean container of sufficient quantity to be divided into the required number of sub-samples which in turn should be sufficient to carry out the required tests, typically 500-750 ml per sub-sample and in any case no less than 400 ml.

9.5 The contents of the single original sample should be decanted into the required number of clean sub-sample containers. This will typically involve agitating the bulk container and partially filling each sub-sample container in turn to a quarter or a third of their capacity, then repeating the process (agitating and decanting) until all the sub-sample containers have been filled.

9.6 The entire process, including sealing and labelling the sample containers, should be witnessed by representatives for both parties (the party supplying a cargo or product and the receiving party) and the resulting unique sample seal numbers recorded on the relevant documentation (e.g. the BDN) and countersigned by representatives for both parties.

9.7 Employing the services of an independent surveyor to oversee and witness the process may also be considered, in which case all sample seal numbers pertaining to the sampling should be recorded by the bunker surveyor in the sample witnessing and receipt.

Sampling in the supply chain

9.8 Sampling and testing should be carried out and documented at each point of product custody transfer throughout the supply chain.

9.9 A representative sample should be collected when loading bunker supply ships from shore tanks, floating storage facilities and tankers. The recommended method is a sample drawn throughout the loading at the point of custody transfer. The sampling should be witnessed and the resulting sample containers sealed, labelled and countersigned by representatives for both the cargo recipient and the tank terminal.

9.10 The supplier should retain the cargo transfer samples for at least 30 days. In the event of a quality dispute arising, samples should be kept until the dispute has been resolved.

Sampling during delivery to ship

9.11 Suppliers should follow the *2009 Guidelines for the sampling of fuel oil for determination of compliance with the revised MARPOL Annex VI* (resolution MEPC.182(59)) which states that the supplier should provide a MARPOL sample drawn by the supplier's representative at the receiving ship's bunker inlet manifold.

9.12 If for safety or practical reasons the supplier's representative cannot move between the barge and the receiving ship to be physically present, the process may be observed visually by alternative means.

9.13 To facilitate effective remote witnessing of drawing of commercial samples, visibility of the sampling equipment on bunker barge can be improved by marking the sampling zone with high visibility tape or paint.

9.14 The final resulting sample containers should be sealed, labelled and countersigned by representatives for both parties.

9.15 The supplier's representative commercial samples should be retained by the supplier for a minimum of 30 days. In the event of a quality dispute arising during the sample retention period, the samples should be retained until the dispute has been resolved.

10 Testing and interpretation of test results in the supply chain

10.1 Testing should be carried out on samples from each point of product custody transfer throughout the supply chain and documented so the analysis report is matched to the product origin. This is a key part of a QMS to enable transparency and traceability and assist the supplier to identify the origin of potential problems and take steps to remedy and prevent further quality issues.

10.2 The testing analysis should be done according to the relevant internationally recognized test methods.

10.3 For the bunker producer/supplier, the recommendation is that the blend target should not be the actual specification limit, but rather the limit minus (or plus if it is a minimum limit) an appropriate safety margin. For the bunker producer/supplier to ensure that the product meets the specification limit with 95% confidence, the blend target should be the limit minus 0.59R for a maximum limit (or plus 0.59R for a minimum limit).

10.4 Further information can be found in a 2016 guidance document from CIMAC freely available online at the following link: http://www.cimac.com/cms/upload/workinggroups/WG7/CIMAC_WG07_2016_Feb_Guideline_Interpretation__Fuel_Analysis_Test_Results_Final.pdf and Section 8 of ISO 8217, precision and interpretation of test results.

11 Documentation

11.1 Documentation is a crucial part of the QMS in order to achieve transparency and traceability in the supply chain. This includes records of custody transfer of cargoes, certificates of quality (COQ), sample seal numbers and quality analysis reports.

11.2 Suppliers are responsible for providing bunker delivery notes (BDNs) to the receiving ship and safety data sheets (SDS) in line with the requirements of SOLAS regulation VI/5-1. It is the supplier's responsibility to ensure that the bunkers delivered to ship are in conformity with the details provided on the BDN and SDS.

11.3 In addition to the minimum requirements (BDN and SDS), suppliers are recommended to provide other supportive documentation such as copies of COQs and quality analysis reports and information on properties that may affect how the bunkers behave during storage and handling on the receiving ship. This might assist the ship to store and handle the fuel in a safe and efficient manner.

Cargo custody transfer

11.4 For cargo custody transfers, documentation should include at least the following:

.1 certificate of receipt identifying the owner of the cargo prior to custody transfer and the new owner;

.2 name of tanker or tank terminal supplying the cargo to the new owner;

.3 certificate of quality accompanied by laboratory analysis report; and

.4 sampling sheet recording sampling location(s), sampling method(s) and all sample seal numbers.

Sample labels

11.5 Sample labels should comply with regulation 18.8 of MARPOL Annex VI, as detailed in the *2009 Guidelines for the sampling of fuel oil for determination of compliance with the revised MARPOL Annex VI* (resolution MEPC 182(59)). The following information is required on all sample labels:

.1 location at which, and the method by which, the sample was drawn;

.2 date of commencement of delivery;

.3 name of bunker tanker/bunker installation;

.4 name and IMO number of the receiving ship;

.5 signatures and names of the supplier's representative and the ship's representative;

.6 details of seal identification; and

.7 bunker grade.

11.6 Details of the sample seals should be recorded on the bunker delivery note.

Safety data sheets – SDS (Formerly known as material safety data sheets – MSDS)

11.7 SOLAS regulation VI/5-1 requires that safety data sheets are provided to a ship prior to loading MARPOL Annex I type cargoes and marine fuel oils.

11.8 SDS are intended to inform crew on the receiving ship of all health, safety, handling and environmental risks associated with the cargo/product. Details of the required information are set out in resolution MSC.286(86) on the *Recommendations for material safety data sheets (MSDS) for MARPOL Annex I oil cargo and oil fuel*.

Bunker delivery note – BDN

11.9 The bunker delivery note (BDN) is the official receipt stating the grade and quantity of bunkers supplied to the receiving ship. Regulation 18.5 of MARPOL Annex VI and appendix V of MARPOL Annex VI stipulates information to be included in the BDN.

11.10 Additional details, beyond the MARPOL requirements, may be included on the BDN according to local requirements and the commercial requirements of the supplier.

11.11 The BDN should be signed by both the supplier's representative and the representative of the receiving ship and retained by the supplier for at least three years as per regulation 18.9.3 of MARPOL Annex VI.

Supporting documentation

11.12 Suppliers should, where possible, provide bunker buyers with copies of the product's certificate of quality (COQ) and associated laboratory analysis reports verifying the details on the COQ. These may include more detailed information on specific quality parameters which would be helpful to the crew on the receiving ship in applying appropriate fuel management, including pre-treatment prior to use.

Fuel properties/handling advice

11.13 The supplier should provide information on properties that may affect how the bunkers behave during storage and handling on the receiving ship, if the product supplied differs in handling characteristics from traditional/mainstream bunkers.

11.14 This information should include any special fuel management and handling requirements such as heating, special attention to pre-treatment in separators and centrifuges, and any known compatibility issues particular to the product.

11.15 For distillate fuels, suppliers should report cloud point (CP), cold filter plugging point (CFPP) and pour point (PP). ISO 8217 fuel oil specifications require these fuel oil cold characteristic to be tested. This information helps the ship's crew determine if the fuel will need heating. The responsibility for ordering a product with appropriate CP, CFPP and PP for the ship's operational needs rests with the buyer.

Licensing

11.16 In those States/ports that operate established licensing regimes for bunker suppliers, the bunker supplier should provide evidence to confirm the licence(s).

Quality management systems (QMS)

11.17 Suppliers should have quality management systems (QMS) in place and be able to provide evidence to bunker buyers if required. In cases where a supplier has its own internal QMS, it should be able to provide a summary to bunker buyers upon request. The QMS documentation should include references to the standards which the supplier will adhere to along with any independent third party accreditation of the QMS or elements of the QMS.

12 Contracting

12.1 Selling and buying bunkers is a commercial activity involving contracting parties, which in the case of bunker suppliers and bunker buyers can include a variety of parties. The "contract" in this instance covers both the supplier's general terms and conditions and the actual purchasing order.

12.2 The contract specifies the product(s) to be supplied, quantity and details of how the supplier will fulfil the contractual agreement, and should include claim/dispute clauses. Dispute handling/resolution arrangements in case of dispute should be specified.

12.3 Bunker specifications and any requirements for bunkering procedures should be stated in the contract. The contract should:

.1 state the quantity ordered, the required maximum sulphur content and that the fuel is to meet the applicable requirements in regulation 18 of MARPOL Annex VI;

.2 include a detailed technical specification for the fuel along with acceptable quality parameters;

.3 where the fuel is specified with reference to ISO 8217 Petroleum products -- Fuels (class F) -- Specifications, the contract should clearly state which edition is to be used (i.e. 2005, 2010, 2012 or 2017). Using the latest edition is encouraged where possible; and

.4 for non-ISO 8217 standard fuel oils, as a minimum the contract should specify that the bunkers provided meet the requirements of regulations 18.3.1 and 18.3.2 of MARPOL Annex VI, and SOLAS chapter II-2. If the product is close to an ISO 8217 grade, but will not meet specific parameters, those exemptions should be mutually agreed in advance and specified in the purchase order and contract.

12.4 If the bunker buyer orders fuel with a sulphur content exceeding the limit in MARPOL Annex VI, the supplier should obtain a notification from the bunker buyer that the fuel will be used with an approved alternative means of compliance such as exhaust gas cleaning. The supplier should ensure the notification is communicated to the supplier's representative overseeing the physical delivery (e.g. the cargo officer).

12.5 Unless otherwise permitted by MARPOL Annex VI and confirmed by supporting documentation, e.g. ships installed with an alternative means of compliance with the fuel oil sulphur content limit, the supplier should not supply fuel oil which is not compliant with relevant statutory requirements and specifications.

12.6 The contract terms and conditions should stipulate how the laboratory analysis will be carried out in the case of disputes.

12.7 The contract should specify that the laboratory should be independent and certified to ISO 17025 or an equivalent standard.

13 Dispute resolution

13.1 Dispute handling/resolution arrangements in case of dispute should be specified in the contract.

13.2 Following the ship's own testing programme, if the results lead to a quality dispute where the suppliers retained commercial sample is to be tested, it is recommended that breaking the seal of that sample is witnessed by representatives for both the supplier and the buyer. If the test on the supplier's retained commercial sample fails to meet the specified maximum/minimum limit, the product has not met that specification limit.

13.3 If the cause for the failure of the product to meet specification lies with parties other than the contracting bunker supplier, for example the original bunker blend provider or the bunker tanker/barge operator delivering the product on the contracting supplier's behalf, it is up to the supplier to seek compensation from these parties.

13.4 If a product that has been delivered is proven by test results to be off-specification, but has not yet been used, the supplier should enter into constructive dialogue with the buyer and support the buyer with regards to remedial action including debunkering, if required.

13.5 In cases where a ship experiences operational problems suspected but not specifically proven to be caused by the fuel, the supplier should offer any assistance they are capable of to the buyer in trying to determine the root cause. This may involve, for example, information on product origin to help build knowledge of cargo sources that may be associated with unusual or unexpected operational issues.